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***Graduate School
of Engineering
Northeastern University
1982–84***

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The Northeastern University catalog contains *current information* regarding the University calendar, admissions, degree requirements, fees, and regulations, and such information is not intended to be and should not be relied upon as a statement of the University's contractual undertakings.

Northeastern University reserves the right in its sole judgment to promulgate and change rules and regulations and to make changes of any nature in its program, calendar, admissions policies, procedures and standards, degree requirements, fees, and academic schedule whenever it is deemed necessary or desirable, including, without limitation, changes in course content, the re-scheduling of classes, cancelling of scheduled classes and other academic activities and requiring or affording alternatives for scheduled classes or other academic activities, in any such case giving such notice as is reasonably practicable under the circumstances.

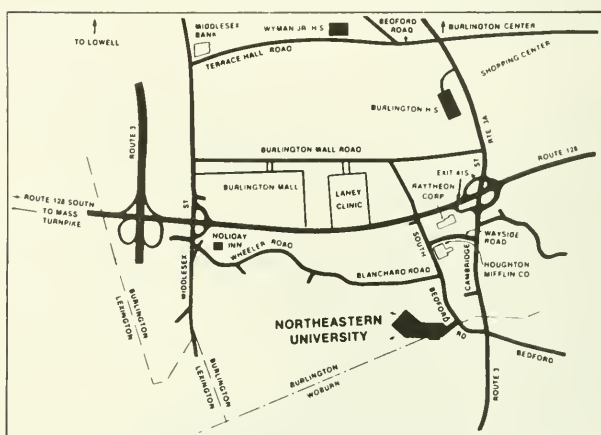
We at Northeastern will do our best to make available to you the finest education we can provide, the most stimulating atmosphere in which to learn, and the most congenial conditions under which you may enjoy the learning experience. But the quality and the rate of progress of your academic career is in large measure dependent upon your own abilities, commitment, and effort. You will be a full participant in an educational partnership. We will and, indeed, can only make the opportunities available to you; it is up to you to take advantage of them.

This is equally true with your career upon graduation. We cannot guarantee that you will obtain any particular job; that will depend upon your own skills, achievement, presentation, and other factors such as market conditions at that time. Similarly, in many professions and occupations there are increasing requirements imposed by federal and state statutes and regulatory agencies for certification or entry into a particular field. These may change during the period of time when you are at Northeastern and they may vary from state to state. While we will be ready to help you find out about these requirements and changes, it is your responsibility to initiate the inquiry because we cannot know what your expectations and understandings are unless you tell us.

In brief, what we are saying to you is that we are here to offer you educational opportunities and choices and to assist you in finding the direction in which you want to steer your educational experience. But you are a partner in this venture with an obligation and responsibility to yourself.

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Suburban Campus and Burlington High School

ACADEMIC CALENDAR 1982-83

Fall Quarter 1982

Registration period		
Burlington	Sept. 14-15	1:00-3:00 p.m., 5:30-8:00 p.m.
Boston	Sept. 20-23	1:00-8:00 p.m.
Classes begin	Sept. 27	
Last day to drop a course	Oct. 29	
Examination period	Dec. 13-18	

Winter Quarter 1982-83

Registration period		
Burlington	Nov. 30	1:00-3:00 p.m., 5:30-8:00 p.m.
Boston	Dec. 6-9	1:00-3:00 p.m., 5:30-8:00 p.m.
Classes begin	Jan. 3	
Last day to drop a course	Feb. 4	
Examination period	March 21-26	

Spring Quarter 1983

Registration period		
Burlington	March 8	1:00-3:00 p.m., 5:30-8:00 p.m.
Boston	March 14-17	1:00-3:00 p.m., 5:30-8:00 p.m.
Classes begin	April 4	
Last day to file card for Spring Commencement	May 15	
Last day to pay fee for Spring Commencement	May 20	
Last day to drop a course	May 6	
Examination period	June 13-18	
Spring Commencement	June 19	

Summer Quarter 1983

Registration period		
Burlington	June 13-14	5:30-8:00 p.m.
Boston	June 15-16	5:30-8:00 p.m.
Classes begin	June 27	
Last day to file card for Fall Commencement	Aug. 15	
Last day to pay fee for Fall Commencement	Aug. 29	

NOTE: For 1984 calendar, contact Registrar's Office, 120 Hayden Hall, 437-2181.

Calendar changes may be made. The University Community will be notified if such changes are necessary.

UNIVERSITY HOLIDAYS 1982-83

Columbus Day	Monday	October 11
Veterans Day	Thursday	November 11
Thanksgiving Recess	Thursday—Saturday	November 25-28
Christmas Vacation	Monday—Saturday	Dec. 20-Jan. 2
Martin Luther King, Jr., Day	Saturday	January 15
Washington's Birthday	Monday	February 21
Patriots' Day	Monday	April 19
Memorial Day	Monday	May 24
Independence Day	Monday	July 4
Labor Day	Monday	September 6

Equal Opportunity Policy

Northeastern University is committed to a policy of providing equal opportunity for all. In all matters involving admissions, registration, and all official relationships with students, including evaluation of academic performance, the University insists on a policy of nondiscrimination.

Northeastern University is also an equal opportunity employer; it is institutional policy that there shall not be any discrimination against any employee or applicant for employment because of race, color, religion, sex, age, national origin, or on the basis of being a handicapped but otherwise qualified individual. In addition, Northeastern takes affirmative action in the recruitment of students and employees. Further, Northeastern will not condone any form of sexual harassment.

Inquiries concerning our equal opportunity policies may be referred to the University Title IX Coordinator/Compliance Officer for Section 504 of the Rehabilitation Act of 1973, Affirmative Action Office, 175 Richards Hall, 617-437-2133 or -2139. Northeastern's efforts to comply with the Title IX Educational Amendments of 1972 are also coordinated by the Dean and Director of Affirmative Action, 175 Richards Hall.

Family Educational Rights and Privacy Act

In accordance with the Family Educational Rights and Privacy Act of 1974, Northeastern University permits its students to inspect their records wherever appropriate and to challenge specific parts of them when they feel it necessary to do so. Specific details of the law as it applies to Northeastern are printed in the *Student Handbook* and are distributed annually at registrations of University College and the graduate schools.

Emergency Closing of the University

Northeastern University has made arrangements to notify students, faculty, and staff by radio when it becomes necessary to cancel classes because of extremely inclement weather. Radio stations WBZ, WBCN, WEEI, WRBB, WHDH, WHUE, WJDA, WCOZ, WRKO, WLYN, WKOX, WVBF, WHAV, and WLLH will announce the University's decision to close.

The Office of Services for the Handicapped

The Office of Services for the Handicapped (OSH) provides a variety of support services and general assistance to all of Northeastern's disabled students and employees. The University's efforts to comply with the Rehabilitation Act of 1973 are coordinated by Ruth Bork, OSH Director, 5 Ell Center, 617-437-2675.

Fee Disclaimer

Tuition rates, all fees, rules and regulations, courses and course content are subject to revision by the President and Board of Trustees at any time.



the university

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of nearly 180 distinguished business and professional men and women.

From its beginning, Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not attempted to duplicate the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Education Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922); Arts and Sciences (1935); Education (1953); Pharmacy (1962); Nursing (1964); Boston-Bouvé College (1964); the College of Criminal Justice (1967); and by Lincoln College's daytime Bachelor of Engineering Technology program (1971). This educational method offers students the opportunity to gain valuable practical experience as an integral part of their college program and often provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, rehabilitation administration, professional accounting, business administration, and law.

In the field of adult education, programs of study have been developed to meet a variety of needs. University College offers evening courses — offered by the University since 1906 — and adult day courses leading to the bachelor's degree. In addition to offering day undergraduate programs in Electrical Engineering Technology and Mechanical Engineering Technology, Lincoln College offers evening/part-time certificate, associate, and bachelor degree programs in technological areas. All formal courses of study leading to degrees through part-time programs are approved by the Basic College faculties concerned.

GRADUATE AND PROFESSIONAL SCHOOLS

The eight graduate and professional schools of the University offer day and evening programs leading to the degrees listed.

The Graduate School of Arts and Sciences offers the degrees of Master of Arts, Master of Science, Master of Science in Health Science, Master of Public Administration, and Doctor of Philosophy. A program leading to the Certificate of Advanced Graduate Study in the field of Library Study is also available.

The Graduate School of Boston-Bouvé College of Human Development Professions offers the degrees of Master of Science, Master of Education, Doctor of Education, and the Certificate of Advanced Graduate Study.

The Graduate School of Business Administration offers the degree of Master of Business Administration.

The Graduate Program in Criminal Justice offers the degree of Master of Science.

The Graduate School of Engineering offers the degrees of Master of Science, Engineer degree, Doctor of Engineering, and Doctor of Philosophy.

The School of Law offers the degree of Juris Doctor.

The Graduate School of Pharmacy and Allied Health Professions offers the degrees of Master of Science, Doctor of Philosophy, and Doctor of Pharmacy.

The Graduate School of Professional Accounting offers the degree of Master of Science in Accounting.

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education, located in Waltham, Massachusetts, serves the educational needs of the community through workshops, conferences, special programs, and public offerings. Programs include State-of-the-Art Engineering, Supervisory Management, Emergency Medical Technician, Paramedic, Graphic Arts, Food Industry, Paralegal, and many other specialized areas of interest. The Center awards nationally recognized Continuing Education Units (CEUs) to students who satisfactorily complete the programs. For further information about the Center's programs, telephone 617-890-1134.

RESEARCH

Northeastern University recognizes the importance of high quality research as an essential ingredient of academic life. The University's maturing focus on research takes into account not only the intrinsic value of specific research projects, but it also acknowledges the importance of research as a vital and integral part of graduate education.

Responsibility for fostering and coordinating the development of research at Northeastern resides with the vice provost for Research and Graduate Studies. Assisting him is the University Council on Research and Scholarship, which serves as an advisory body for dealing with broad policy issues as well as with procedures for encouraging and facilitating research and scholarship. The administrative support for research projects and training programs is provided by the Office of Sponsored Programs, whose services include the preparation and transmittal of proposals and reports, the monitoring of contracts and grant funds, and assistance in locating sources of support. A recently introduced newsletter entitled *Re:Search* brings information about the research and scholarly efforts of Northeastern's faculty and students to the University community and the general public.

Faculty and graduate students receive funding for their research from a variety of sources including government agencies, private industry, and foundations.

The National Institutes of Health, National Science Foundation, the National Endowment for the Humanities, IBM, Dow Chemical, and the Mellon Foundation are but a few of the organizations providing support. The University also contributes to many research projects through its own Research and Scholarship Development Fund. The fund was established to stimulate new ventures in research and scholarship and to provide seed money for the exploration of new ideas and approaches to problems which are likely to lead to high quality publications and extramural support.

Northeastern University has numerous distinguished faculty members, many of whom have received prestigious awards, including Sloan Scholarships, Guggenheim Fellowships, and National Institutes of Health Research Awards. Faculty members lecture the world over. Additionally, many faculty members serve as United States government consultants and participate on a variety of national and international committees.

Current research activities span almost every academic field and include laboratory projects, theoretical studies, and technological applications. Research is underway in the areas of business, physical and biological sciences, social sciences, humanities, allied health professions, and engineering. Student participation in these activities can take place as part of regular academic programs in the form of specially-designed independent studies, or through cooperative work assignments. Research involvement is actively encouraged and is limited only by the student's own motivation and curiosity.

The following summary of research represents just a small sample of the multitude of projects now underway throughout the University.

In the College of Arts and Sciences, research projects reflect the diversity of its nineteen departments. Research in the humanities and natural and social sciences includes studies in nineteenth century Boston architecture, the Off-Off Broadway theater, cable TV, quantum field theory, and infrared spectroscopy.

As part of the College's interdisciplinary interest in marine sciences, the Marine Science and Maritime Studies Center has been established. At the Nahant field station and laboratory of this Center, faculty and graduate students perform studies in marine chemistry, biology, and botany.

The nature of research in Boston-Bouvé College of Human Development Professions is broad in range and diverse in approach. Changes in human development and the roles of the teacher and clinician in facilitating such changes are topics of lively interest. Some of the current research interests of the College include the communication abilities in normal and hearing-impaired individuals, the role of exercise in cardiovascular health and disease, the relationship between age change and the development of motor and cognitive skills in children, the evaluation of clinical practice in physical therapy, and educational practices in the schools, and the examination of barriers to the employment of the disabled in leisure services.

Research in the College of Business Administration is divided between the theoretical and practical aspects of management, human resources, and marketing. New ideas in corporate practice and theory are conceived through in-

vestigations that include high technology, small business entrepreneurship, and foreign investment in developing countries. Other studies cover U.S. transportation problems, federal regulatory agencies, and technology forecasting for emerging high technology firms.

The College of Criminal Justice is one of the few institutions in the United States where crime and law are studied from interdisciplinary viewpoints. The focus of research in this College is on crime detection and prevention, industrial espionage, private security systems, and contemporary terrorism.

Research in the College of Engineering encompasses some of today's most important technological issues. Robotics, CAD/CAM, telecommunications, and space rocketry design are some of the areas under investigation. The College maintains close ties with industry, thereby augmenting its facilities and professional expertise. Other research activities deal with environmental, health, and transportation concerns.

The School of Law's research topics include an historical look at the Securities and Exchange Commission and studies of the new civil procedures. One project deals with the effects of the landmark *Tarasoff* court case on the mental health profession. National law school curricula policies are also under investigation.

The College of Nursing is addressing some of the important problems currently facing the entire nursing profession. An answer to nursing burnout is sought in the College's new school nurse practitioner program. Assessments of this new direction in nursing, and other employment possibilities and problems, are areas in which the faculty are directing their research efforts.

Research studies in the College of Pharmacy and Allied Health Professions include topics such as new analytical methods for antidepressant and anticonvulsant drugs, the synthesis of new drugs, improving diagnostic techniques for cancer of the bladder, and the study of clinical applications in respiratory therapy.

The Cooperative Education Research Center is concerned with the social and educational impact of the cooperative education mode. Through statistical surveys, data on cooperative education are compiled. Conclusions reached at this Center have important implications for future college costs, career opportunities, and educational priorities.

Northeastern also has several interdisciplinary centers and institutes in which research spanning several disciplines is performed.

The Institute of Chemical Analysis, Applications, and Forensic Science carries out basic research in analytical chemistry and material science. The Institute is also concerned with applications of these fields in industry, environmental regulatory agencies, and law and police departments. It has an international reputation in the fields of chromatography, mass spectrometry, amorphous metals, and solar energy storage devices.

The center for Electron Microscopy provides advanced scientific equipment for the training of scientists and the performance of research into cellular and subcellular structures.

The Institute for the Interdisciplinary Study of Education serves as a center for the exchange of ideas on critical issues in education. The high technology industry, South African education, and community college programs for prisoners are topics of current research.

The Center for Applied Social Research is a nationally known center for studies dealing with current public and social policy issues. Projects are presently underway in the fields of criminal justice, public safety, mental health, social welfare, and education.

Northeastern University is accredited by the New England Association of Schools and Colleges, Inc., which accredits schools and colleges in the six New England states. Accreditation by the Association indicates that the institution has been carefully evaluated and found to meet standards agreed upon by qualified educators.

buildings and facilities

MAIN CAMPUS

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, the Boston Public Library, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 50 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

Ell Student Center

The Carl S. Ell Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

Libraries

The University library system consists of the Dodge Library, which is the main library; the Suburban Campus Library at Burlington; the School of Law Library; and divisional libraries for Physics and Electrical Engineering, Chemistry and Biology, Mathematics and Psychology, Health Education, Physical Education, Recreation and Leisure Studies, and Physical Therapy. There are additional subject collections for the Center for Management Development at Andover, Massachusetts, and the Marine Science Institute in Nahant.

The library collections number 470,000 volumes supplemented by some 550,000 titles in microprint, microfilm, and microfiche forms. The collection includes, in addition, 3,876 periodical titles, 100,000 documents, and more than 5,000 sound recordings.

Cabot Physical Education Center

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. It contains four basketball courts, an athletic cage, and a women's gymnasium, as well as administrative offices for the Department of Athletics and for the Physical Education Department of Boston-Bouv  College of Human Development Professions.

The Barletta Natatorium houses a 105-foot swimming pool, a practice tank for the crew, handball and raquetball courts, and shower and dressing facilities.

Northeastern Arena

Two blocks and a right turn away from the main quadrangle on Northeastern University's campus is the oldest indoor ice hockey arena in the United States and one of the focal points for amateur athletics in the Boston area.

Today, the Arena is primarily devoted to hockey and collegiate sports, but has expanded its university athletic focus to include all men's basketball contests and many women's varsity contests.

With more than a million and a half dollars already invested in the Arena, the building is a jewel to the eye and a credit to the community. So long as Northeastern owns the Arena, it will continue to meet the needs of the surrounding community as a superior recreational facility.

Dockser Hall

Charles and Estelle Dockser Hall, completed in 1968, houses a large gymnasium, dance studio, motor performance laboratory, college library, community recreation laboratory, folk arts center, a darkroom, recreation resources area, locker rooms, offices, classrooms, conference room and lounge, storage facilities, and a research laboratory.

SUBURBAN FACILITIES

Suburban Campus

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and noncredit state-of-the-art programs are offered.

Warren Center

The Warren Center is a practical laboratory for Boston-Bouv  College of Human Development Professions in outdoor education and conservation, in group practicum, and in camping administration, programming, and counseling. At this Center in Ashland, completed in 1967, there are tennis courts, field

hockey and lacrosse fields, waterfront for swimming and boating, overnight camp sites, fields and forests, heated cottages, the Hayden Lodge with a recreation hall, library, crafts shop, dining facilities, and conference accommodations.

Henderson House

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is located 12 miles from the main campus.

Marine Science and Maritime Studies Center

The Marine Science and Maritime Studies Center at Nahant, Massachusetts, is a research and instructional facility primarily engaged in studies of marine biology and oceanography. The Institute is operated all year, and is located about 20 miles northeast of Boston. Many of the courses at this institute are applicable toward an advanced degree in biology or health science.

Dedham Campus

The Dedham Campus is Northeastern University's newest addition and is located on Route 135 just north of Route 128. The facility contains eleven classrooms, two executive case-study rooms, a dining area and a computer room. There is also a library and a number of seminar rooms.

regulations of the graduate school of engineering

The Master of Science degree may be earned in Chemical Engineering, Civil Engineering, Electrical Engineering, Industrial Engineering, Mechanical Engineering, Engineering Management, and Information Systems. In addition, there are programs leading to the Doctor of Philosophy degree in Chemical Engineering, Civil Engineering, Electrical Engineering, and Mechanical Engineering. The Doctor of Engineering degree is offered in Chemical Engineering. The Engineer degree may be earned in Electrical Engineering, Mechanical Engineering, and Industrial Engineering.

Cooperative Programs

A unique feature of Northeastern's Graduate School of Engineering is the full-time Cooperative Education Plan. This program adopts the philosophy that a balanced exposure to theory and practice will provide students with a more meaningful education.

The program includes nine months of classroom study and twelve months of work experience in an industrial concern. The cooperative student has the opportunity to gain vital experience in a professional environment while also supplementing his tuition payments.

The University has a full-time experienced staff to assist the student in obtaining a cooperative work assignment. Though the university cannot guarantee Cooperative Education employment to any student, its record of successful placements has been excellent. The student may also wish to investigate employment opportunities on his own in order to facilitate final placement by the graduate coordinator.

Graduate Engineering Cooperative Program

The cooperative programs are offered on two schedules. Both programs require an eighteen-month commitment for completing degree requirements. The *alternating* cooperative program is sequenced so that the work periods are of three and six months duration and are interspersed with three-month periods of classroom study in which students carry a full-time academic load of twelve quarter hours.

Alternating Schedule

Fall	School
Winter	Work
Spring	School
Summer	Work
Fall	Work
Winter	School

In the *parallel* program of cooperative education, a student is on work assignment for approximately thirty hours per week. In addition, the student is required to carry an academic load of eight hours per quarter. Except for the student's first quarter, this combination of classroom study and work is followed in each quarter of the traditional academic year.

Parallel Schedule

Fall	School	
Winter	School	Work
Spring	School	Work
Summer		Work
Fall	School	Work
Winter	School	Work

Normally, the Cooperative Plan operates as shown above. Economic conditions, the military, citizenship, and other factors may cause a departure from the normal Plan.

Engineering Sponsorships

Another aspect of Cooperative Education is the Engineering Sponsorship Program. This program provides students with exposure to academic theory and industrial experience. The sponsoring Company, by employing the students during cooperative work quarters, provides a monthly salary for the two (2) year period plus a tuition stipend.

All students who are accepted as full-time cooperative students are considered for Engineering Sponsorships. Notification will be received prior to April 15th if a student has been chosen for a sponsorship. Those students not chosen are still eligible for placement under the Cooperative Plan of Education.

GENERAL REGULATIONS

The general regulations and minimum requirements for all graduate programs are established by the University Graduate Council. In some matters the committee of each graduate school is allowed discretion to establish regulations within limits defined by the council. The regulations and academic requirements which follow have been formulated in accordance with this general policy.

Application Procedures

All applicants for cooperative full-time or continuous full-time study at the master's level should address inquiries to their respective departments or to the Graduate School of Engineering. Application forms and reference blanks will be mailed to the applicant. This material, together with the \$25 nonrefundable application fee, two transcripts, two letters of recommendation, the Graduate Record Examination scores when required, and the results of the Test of English as a Foreign Language (required of all applicants whose native language is not English), should be returned to the Graduate School of Engineering Office as soon after January 15th as possible. The Admissions Committee will notify applicants as soon as their material is complete.

All applicants for part-time study at the master's level should request an application from the Graduate School of Engineering Office. The completed application, the nonrefundable \$25 application fee and an official transcript should be sent to the graduate school no later than two weeks prior to the registration period for the quarter in which applicants plan to begin their programs. The dates of the registration periods are announced in the catalog (see academic calendar) and in the circular issued each July. Applicants will be notified by mail regarding acceptance. Mailed applications will be accepted up to two weeks prior to the registration period for the quarter in which the applicant plans to begin the program.

If an applicant is unable to submit the application material by mail at least two weeks prior to the registration period, he should call the Graduate School Office to arrange for a personal interview to determine his qualifications for admission. The application, the nonrefundable \$25 application fee and the official transcript may be submitted at the interview.

In some cases, the Graduate Record Examination may be required of applicants. The examination is administered by the Educational Testing Service, Box 955, Princeton, New Jersey, 08540. Applicants must make their own arrangements with the Educational Testing Service for the examination.

Test scores for Graduate Record Examinations and Test of English as a Foreign Language sent to the Graduate School of Engineering are retained for only one year from the date they were taken. If an applicant does not enroll in the quarter for which he was accepted, but delays his registration for a period of one year or more from the date that he originally took his examinations, he must repeat the examinations or resubmit the original test scores before he will be permitted to register.

Transcripts

Official transcripts of previous college training must be supplied with the mailed application if an admissions decision is to be rendered by return mail, or submitted at the personal interview. If this is not feasible, the official transcripts must be mailed to the Graduate School of Engineering as soon after the initial registration as possible. Students who have attended institutions outside of the United States should provide comparable certified documents.

Students failing to file the necessary transcripts within one academic quarter after acceptance will be withdrawn from the Graduate School of Engineering.

Admission

To be admitted for graduate work, an applicant must have obtained a Bachelor of Science degree in engineering or a closely related science from a recognized college or university with an acceptable quality of undergraduate work. His scholastic record, therefore, must show ability to pursue creditably a program of graduate study, and his undergraduate training must indicate breadth as well as adequate preparation in the field in which the applicant expects to do advanced work. Acceptance to the school is granted upon recommendation of the departmental graduate committee or its designate following a review of the application and supporting material. The recommendation is based upon promise of academic success and fulfillment of minimum criteria established by each department in the Graduate School of Engineering.

Students with an engineering or related science bachelor's degree, who are enrolled in another graduate school at Northeastern, may transfer to the Graduate School of Engineering. However, they must make application and file the necessary documents, the same as transfers from other colleges or universities. The submission of registration materials for engineering course work does not constitute enrollment in the Graduate School of Engineering.

Registration

Students must register within the dates and times listed on the school calendar. The place of registration will be announced prior to each period.

Auditors are not permitted. All students attending any course in the Graduate School of Engineering must be officially registered by the Registrar and listed on the class roster. Informing the instructor of the intention to attend the course does not constitute official registration and will not be recognized by the Registrar or the Graduate School of Engineering.

Any student who has not officially registered through the Registrar's Office by the end of the fifth calendar week of a quarter will not have any grades posted to their record.

Residence

All work for advanced degrees must be completed at the University unless approval has been obtained from the director of the graduate school for work taken elsewhere. Students who are in residence and are using the facilities of the University must register for such work.

Programs of Study

The curricula of the degree programs are given under each departmental heading. The descriptions of courses offered by the several departments are given so that prospective students may obtain a view of the course coverage.

Preparation courses are indicated when necessary. Not all courses are offered every year, but the course offerings will be arranged in such a manner that students may make continuous progress toward the degree.

The Graduate School of Engineering issues a circular close to July 1st which gives the courses for the following academic year and the times at which they meet.

The number of students enrolled in each class will be limited to permit effective teaching at the graduate level. The University reserves the right to cancel, postpone, combine, or modify any course.

At the time of his first registration, each full-time student must develop, with the assistance of his faculty adviser, a complete program of study for the degree for which he is registered. All subsequent changes must be approved by his faculty adviser.

Part-time students will be expected to complete the required courses outlined by each department, after which the elective courses may be undertaken. The study load for such students is limited to a program of two courses (4 quarter hours) per quarter, unless special permission to carry a heavier load is given by the director of the graduate school.

Grading System

The performance of students in graduate courses will be recorded by the instructor by use of the following grades:

A (4.0) This grade is given to those students whose performance in the course has been of very high graduate caliber.

A- (3.667)

B+ (3.333)

B (3.0) This grade is given to those students whose performance in the course has been at a satisfactory level.

B- (2.667)

C+ (2.333)

C (2.0) This grade is given to those students whose performance in the course is not at the level expected in graduate work.

C- (1.667)

F (0) This grade is given to those students whose performance in the course is unacceptable.

Individual faculty members may choose not to use plus and minus designations. If they use whole letters only, they must announce this to the class at the beginning of the quarter.

In addition, the following letter designations are used:

I Incomplete

This grade is given to those students who fail to complete the work of the course, and this work must be completed within one calendar year.

W Withdrawal

This grade is given to those students who were still officially registered at the end of the fifth calendar week of a quarter and then officially withdrew from classes.

22 / REGULATIONS

S Satisfactory without quality designation.

U Unsatisfactory without quality designation.

These grades are used for the first quarter of a two-quarter sequence in which the grade for the second quarter applies to both the first and second quarters of the sequence. The designations S and U may also be used for thesis and seminar work.

Prerequisite/Advanced Undergraduate Courses

Prerequisite courses and advanced undergraduate courses will not be given credit unless approved by an academic adviser. Approval must be made on a graduate engineering petition form and submitted to the Graduate Engineering office. The maximum number of credits allowed is determined by each academic department; refer to regulations as specified under course descriptions for each department. All courses of an undergraduate or prerequisite level are indicated by an asterisk (*) and apply to the quarter hour restrictions of the academic department.

Incomplete Grades

The I grade will be changed to a letter grade upon removal of the deficiency which caused the grade of I to be reported. Deficiencies must be made up within the quarter following that for which the grade of I is received unless an extension of time is granted by the instructor. However, such extension of time may not exceed one calendar year.

Any student who wishes to make-up a final examination must obtain permission from the director of the graduate school by the second week of the quarter succeeding that in which the examination was missed. The make-up examination must be taken in that succeeding quarter unless circumstances warrant permission of the director to defer it to one of the next two quarters.

A student who has attained an inordinate number of incompletes or withdrawals may, at the discretion of the Committee on Graduate Study in Engineering be asked to withdraw for failure to show continuous progress toward the degree.

Class Hours and Credits

All credits are entered as quarter hours. A quarter hour of credit is equivalent to three fourths of a semester hour credit. All classes meet on a quarter basis. In the summer session, classes meet for two, six-week periods. The academic calendar in the front of this catalog should be consulted for the opening and closing dates of each academic quarter.

Continuity of Program

Students are expected to maintain continuous progress toward the degree. Any student who has not completed a course within one year must apply to the director for readmission.

Withdrawals

In order to withdraw from a course, a student must fill out an official withdrawal form obtained at the Registrar's Office or at the Suburban Campus Office. Withdrawals may be made through the ninth class meeting of the quarter. Students will be withdrawn as of the date on which they fill out the official withdrawal form. Ceasing to attend a class or notifying the instructor does not constitute an official withdrawal.

Requests for withdrawal from a course after the ninth class meeting of the quarter may be submitted to the Director of the Graduate School, and may be approved to avert unusual hardships on a student.

A grade of W will be given to a student who is still officially registered at the end of the fifth calendar week of a quarter.

Changes in Requirements

The continuing development of the graduate school forces frequent revision of curricula. In every new bulletin some improvements are indicated. When no hardship is imposed on the student because of changes, and when the facilities of the school permit, the student is expected to meet the requirements of the latest bulletin. If the student finds it impossible to meet these requirements, the bulletin for the year in which he entered becomes the binding one.

Filing for the Degree

Each student who plans to graduate either in June or September must submit to the Graduate Registrar's Office a completed commencement data card prior to the deadline listed in the academic calendar for that commencement at which he expects to receive the degree. If the deadline for filing is not met there is no assurance that the degree will be awarded that year. The commencement data card is supplied with the registration materials or is available in the Graduate Registrar's Office.

THE MASTER'S DEGREE

Admission

Specific requirements for each degree program will be found in the appropriate paragraphs for each academic department in the Graduate School of Engineering. General Requirements are listed under *Application Procedures*.

Academic Classifications

Students initially entering the Graduate School are classified into one of three groups according to their admission qualifications.

Regular students are those who meet in full all admittance criteria based on the standards established by the Committee on Graduate Study in Engineering.

Provisional students are those whose records are above the minimum required for acceptance but do not qualify them for regular admission based on

the standards established. Therefore, provisional students must obtain a 3.00 average in their first 12 quarter hours of course work to continue in the graduate school and be reclassified as regular.

Special students are those who do not wish to pursue a master's degree program or who may already possess the master's degree. Special students with only the bachelor's degree must meet the same admission criteria as the regular or provisional student and will be limited to a maximum of 12 quarter hours of graduate credits.

Any student whose record is not satisfactory may be dropped from the program regardless of his classification.

Academic Requirements

A candidate for the master's degree must satisfactorily complete an approved program consisting of a minimum of 40 quarter hours of correlated work of graduate caliber and such other study as may be required by the department in which he is registered.

To qualify for the Master of Science degree from the Graduate School of Engineering each student must have an average grade accumulative of not less than 3.00 with no more than 12 credits below a B- in all courses undertaken at Northeastern University. The Committee on Graduate Study in Engineering allows eight quarter hours of credit to be taken, in addition to the stated degree requirements, to repeat failed required courses or to substitute for elective courses to obtain the required 3.00 average for completion of degree requirements. The number of I grades that a student may accrue will be limited.

Within the above limitations for extra or repeated courses, a required course for which a grade of F is received must be repeated with a grade of C- or better, and may be repeated only once. If a grade of F is received in an elective course, that course may be repeated once to obtain a grade of C- or better, or another elective course may be substituted for it. If a grade of C- is received in a required course, that course may be repeated once to obtain a better grade.

Comprehensive Examination

At the discretion of the department, a final written or oral comprehensive examination may be required. Such examinations will be given at least two weeks before the commencement at which the degree is expected.

Thesis

If a thesis is required in partial fulfillment of degree requirements, it must show independent work based in part upon original material, and must meet the approval of the departmental graduate committee.

The thesis must receive a grade of B or better to be accepted. The original bound copy of the thesis must be deposited in Dodge Library. Instructions for the preparation of the thesis may be obtained from the Graduate School of Engineering.

Transfer Credits

A maximum of 12 quarter hours of credit obtained at another institution may be accepted toward the master's degree provided that the credits transferred are in the candidate's field, consist of work taken at the graduate level for graduate credit, carry grades of B or better, have been earned at a recognized college or university, and have not been used toward any other degree. Students should petition the Graduate School of Engineering in writing for all transfer credit after they have completed 12 quarter hours of graduate engineering work at Northeastern University. Official transcripts and catalog course descriptions must accompany the transfer petition before it will be processed. Grades on transfer credits may not be used for the purpose of obtaining the academic average necessary for completion of the degree requirements.

Time Limitations

Course credits earned in the program of graduate study, or accepted by transfer, are valid for a maximum of seven academic years unless an extension is granted by the Committee on Graduate Study in Engineering.

Financial Aid

A complete description of financial aid available to graduate students can be found in a later section of this catalog.

Cooperative Programs

All the departments offer the Cooperative Education Plan. The Cooperative Education Program offers each participant the opportunity for a variety of learning experiences that directly complement classroom theory. To maintain Cooperative Education status, students on the parallel plan must register for 8 quarter hours of graduate course work per quarter. During quarters of school attendance, students on the alternating plan must carry a continuous full-time academic load.

Full-Time Program

All the departments offer a continuous full-time program in which the requirements for the master's degree can be completed in one academic year, while maintaining at least 12 quarter hours of graduate course work per quarter.

Part-Time Program

All departments offer part-time programs in which the admission requirements are the same as for full-time programs. However, the program is established in such a way that students may progress according to their abilities and the time available. Part-time students may register for a maximum of 4 quarter hours of graduate course work per quarter. The curricula of the part-time programs are specified by the departments.

An official transcript of prior college work must be submitted with an application by those who apply by mail, or at the personal interview for those who apply after the deadline for mailing. Mail applications will be accepted up to two weeks prior to the registration period for the quarter in which the applicant plans to enter the Graduate School.

Honorary Societies

Northeastern University has chapters of Tau Beta Pi, Sigma Xi, and Phi Kappa Phi. Graduate students are eligible for consideration for election to these societies in accordance with the admission requirements of each organization.

THE DOCTOR OF PHILOSOPHY DEGREE

The Doctor of Philosophy degree is awarded to candidates who give evidence of high attainment and research ability in their major field. The degree requirements are administered by committees in charge of each degree program. These committees may be departmental graduate committees or the committee of the graduate school, depending upon the nature of the program. It is the responsibility of the chairman of the committee to certify to the Graduate School of Engineering the completion of each requirement for each candidate.

Admission

Each degree program has an established admission procedure for students starting their doctoral work at Northeastern University. Initial contact should be with the chairman of the appropriate department.

Classification and Degree Candidacy

Students taking advanced graduate work are classified as follows:

1. **Doctoral Student**

Students in this classification have been admitted to a doctoral program.

2. **Doctoral Degree Candidate**

Students in this classification are doctoral students who have completed 40 quarter hours of acceptable graduate work beyond the bachelor's degree and have passed the qualifying examination.

3. **Special Students**

This classification is given to students taking advanced graduate work who are not enrolled for a master's degree, and who have not been admitted to a doctoral program.

Residence Requirement

Candidates for the Doctor of Philosophy degree must spend the equivalent of at least one academic year in residence at the University taking graduate

work. The committee of each degree program specifies the method by which the residence requirement is satisfied.

Qualifying Examination

Students must pass a qualifying examination within time limits set by the committee of the degree program. The material covered in the qualifying examination and the level of course work necessary to prepare for the examination are established by the committee for each program.

Comprehensive Examination

Degree programs may require a comprehensive examination during the time in which a student is a degree candidate. The purpose of this examination is to test the knowledge and skills of the student in a particular area and his knowledge of recent research developments in his field.

Course Requirements

The minimum course requirements of 40 quarter hours constitute the work normally required for a master's degree. The course requirements beyond this are the doctoral course requirements and the amount of such work necessary in each doctoral program is specified by the committee in charge of the doctoral program.

Dissertation

Each doctoral student must complete a dissertation which embodies the results of extended research and makes an original contribution to the field. This work should give evidence of the candidate's ability to carry out independent investigation and interpret in a logical manner the results of the research. The method of approval of the dissertation is established by the committee in charge of the degree program. The original bound copy of the dissertation must be deposited in Dodge Library. Instructions for the preparation of the dissertation may be obtained from the Graduate School of Engineering.

Language Requirement

The foreign language requirement and how it is satisfied is established by the committee in charge of each degree program.

Final Oral Examination

The final oral examination will be taken after completion of all other requirements for the degree. This examination must be held at least two weeks before the commencement at which the degree is to be awarded.

The committee for the final oral examination for the doctoral degree is appointed by the committee in charge of the degree program, and the director of the graduate school is notified of the time of the examination.

The final oral examination will be on the subject matter of the doctoral dissertation and significant developments in the field of the dissertation. Other fields may be included if recommended by the examining committee.

Transfer Credit

If transfer credit for doctoral course work is desired, approval for such transfer credit must be given by the committee in charge of the degree program.

Time Limitation

After the establishment of degree candidacy, a maximum of five years will be allowed for the completion of the degree requirements. If a student wishes to obtain a time extension, he may, with the approval of the committee of his degree program, petition the Committee on Doctoral Degree Programs of the University Graduate Council for such extension.

Registration

All students must register for course work or dissertation as approved by their advisers or the departmental registration officer. After the first registration for doctoral work, registration must be continuous unless withdrawal is allowed by the committee in charge of the degree program. Students must be registered for dissertation during the quarter in which they take the final oral examination.

THE DOCTOR OF ENGINEERING DEGREE

The Doctor of Engineering degree is awarded to candidates who give evidence of high attainment and ability in their major field. The degree requirements are administered by committees in charge of each degree program. These committees may be departmental graduate committees or the committee of the graduate school, depending upon the nature of the program. It is the responsibility of the chairman of the committee to certify to the Graduate School of Engineering the completion of each requirement for each candidate.

Admission

Each degree program has an established admission procedure for students starting their doctoral work at Northeastern University. Initial contact should be with the chairman of the appropriate department.

Classification and Degree Candidacy

Students taking advanced graduate work are classified as follows:

1. **Doctoral Student**

Students in this classification have been admitted to the doctoral program.

2. Doctoral Degree Candidate

Students in this classification are doctoral students who have completed 40 quarter hours of acceptable graduate work beyond the bachelor's degree and have passed the qualifying examination.

3. Special Students

This classification is given to students taking advanced graduate work who are not enrolled for a master's degree, and who have not been admitted to a doctoral program.

Residence Requirement

Candidates for the Doctor of Engineering degree must spend the equivalent of at least one academic year in residence at the University taking graduate work. The committee of each degree program specifies the method by which the residence requirement is satisfied.

Qualifying Examination

Students must pass a qualifying examination within time limits set by the committee of the degree program. The material covered in the qualifying examination and the level of course work necessary to prepare for the examination are established by the committee for each program.

Comprehensive Examination

Degree programs may require a comprehensive examination during the time in which a student is a degree candidate. The purpose of this examination is to test the knowledge and skills of the student in a particular area and his knowledge of recent research developments in this field.

Course Requirements

The minimum course requirements of 40 quarter hours constitute the work normally required for a master's degree. The course requirements beyond this are doctoral course requirements, and the amount of such work necessary in each doctoral program is specified by the committee in charge of the doctoral program.

Dissertation

The dissertation for the Doctor of Engineering degree is fundamentally different from that of the Doctor of Philosophy degree. In general, the latter focuses on contributions to new knowledge in the engineering sciences and is expected to demonstrate the student's competence as a researcher. The dissertation for the Doctor of Engineering degree focuses on creative engineering design and in-depth engineering studies. It may, and usually will, contain elements that involve research, but above all, it must demonstrate the student's ability to work creatively on engineering analysis and design problems such as those en-

countered in professional practice. The method of approval of the dissertation is established by the committee in charge of the degree program. The original bound copy of the dissertation must be deposited in Dodge Library. Instructions for the preparation of the dissertation may be obtained from the Graduate School of Engineering.

Language Requirement

There is no foreign language requirement, but, in lieu of such a requirement, the student must demonstrate proficiency in computer software techniques and an acceptable machine language.

Final Oral Examination

The final oral examination will be taken after completion of all other requirements for the degree. This examination must be held at least two weeks before the commencement at which the degree is to be awarded.

The committee for the final oral examination for the doctoral degree is appointed by the committee in charge of the degree program, and the director of the graduate school is notified of the time of the examination.

The final oral examination will be on the subject matter of the doctoral dissertation and significant developments in the field of the dissertation. Other fields may be included if recommended by the examining committee.

Transfer Credit

If transfer credit for doctoral course work is desired, approval for such transfer credit must be given by the committee in charge of the degree program.

Time Limitation

After the establishment of degree candidacy, a maximum of five years will be allowed for the completion of the degree requirements. If a student wishes to obtain a time extension, he may, with the approval of the committee of his degree program, petition the Committee on Doctoral Degree Programs or the University Graduate Council for such extension.

Registration

All students must register for course work or dissertation as approved by their advisers or the departmental registration officer. After the first registration for doctoral work, registration must be continuous unless withdrawal is allowed by the committee in charge of the degree program. Students must be registered for dissertation during the quarter in which they take the final oral examination.

Professional Experience

The student is required to present evidence of at least one calendar year of experience in engineering practice at a suitable professional level. This ex-

perience must have been acquired after completion of a bachelor's degree in a branch of engineering. The committee in charge of each degree program specifies the details of the professional experience requirement.

INTERDISCIPLINARY PROGRAMS

Some graduate students may wish to pursue doctoral programs which involve substantial work in two or more departments. To meet this need, an interdisciplinary program may be established which corresponds in scope and depth to doctoral standards, but does not agree exactly with the individual departmental regulations. For such possibilities, the following plan is in operation:

Admission

Application for admission to interdisciplinary doctoral study consists of the submission of a carefully thought-out written proposal describing the areas of proposed study and research. The proposal may be a part of the initial application for admission to graduate study at Northeastern University, or it may be submitted by a student already enrolled. It may be directed to a doctoral degree-granting department or to the director of the graduate school, who directs it to the appropriate department. In either case, admission to interdisciplinary doctoral study requires favorable recommendation by the sponsoring doctoral degree-granting department and approval by authorized representatives of the graduate study committees of the departments appropriate to the disciplines covered by the applicant's proposal. The sponsoring department becomes the registration base of the student.

Formation of Interdisciplinary Committee

A student who has been accepted for interdisciplinary study must obtain the consent of an adviser who will direct his doctoral thesis. This adviser, who may or may not be a member of the registration department, will be chairman of the interdisciplinary committee for this student. A second member will be appointed from the registration department by its chairman. These two members will obtain one or more additional members or request the director of the graduate school to do so. At least two departments must be represented on the committee and a majority of the committee must come from doctoral degree-granting departments. The chairman of the registration department will notify the director of the graduate school of the membership of the committee as soon as arrangements are complete.

Duties of Interdisciplinary Committee

A member of the interdisciplinary committee who is also a member of the registration department will serve as the registration officer to approve the course registration for the student. A copy of the approved course registration must also be filed with the other committee members and with the graduate study committee of the registration department.

The interdisciplinary committee will be responsible for the administration of the qualifying examination, language examination, approval of the dissertation, and comprehensive examination. This committee must also certify to the registration department the completion of the requirements for the award of the doctoral degree.

The interdisciplinary committee must assure that the program of the student represents standards comparable to those of the registration department and that the program is not so broad that it has inadequate depth in any area.

The program of the student may be reviewed at any time by the director of the graduate school to determine whether objectives of the program are being met.

THE ENGINEER DEGREE

The degree of Engineer is intended for those who do not wish to make a commitment to post-master's degree graduate study that is as extensive as that required for one of the doctor's degrees. It is an intermediate degree, between master's and doctor's degrees. A student who has completed the Engineer degree is eligible to apply for admission to a doctor's degree program.

Admission

Each departmental Engineer degree program has its own admission procedure for students beginning the program. Normally a master's degree in engineering or related field is required. Initial contact should be with the chairman of the appropriate department.

Classification and Degree Candidacy

A student admitted to the Engineer degree program will be designated as a candidate for this degree.

Residence Requirement

Candidates for the Engineer degree must spend the equivalent of at least two academic quarters in residence at the University taking graduate work. The committee of each degree program specifies the method by which the residence requirement is satisfied.

Qualifying and Comprehensive Examinations

The committee for each Engineer degree program specifies its own examinations. Normally, no qualifying examination is required for candidacy and no comprehensive examination is required for completion, but individual departments offering the degree may require such examinations.

Course Requirements

The minimum course requirement will be 40 quarter hours beyond the master's degree, with no more than 10 quarter hours of credit out of the 40

allowed for work on the dissertation. A minimum of 20 quarter hours must be taken in the department in which the degree is offered. Specific course requirements for each Engineer degree program are determined by the departmental committee in charge of the program.

Dissertation

Each Engineer degree student must complete a dissertation which demonstrates a high level of competence in engineering research, development, or design. As a general guideline, the amount of effort normally expected will be the equivalent of about 10 quarter hours of graduate course work. The method of approval of the dissertation is established by the departmental committee in charge of the degree program. The original bound copy of the dissertation must be deposited in Dodge Library. Instructions for the preparation of the dissertation may be obtained from the Graduate School of Engineering.

Language Requirement

No foreign language is required for the Engineer degree.

Final Oral Examination

A final oral examination may be required by the departmental committee in charge of the Engineer degree program. The examination will normally consist of a defense of the dissertation.

Transfer of Credit

Approval for transfer of credit must be given by the departmental committee in charge of the degree program.

Time Limitation

After admission to the program, a maximum of five years will be allowed for completion of the degree requirements. Extension of this time limit may be granted with the approval of the departmental committee in charge of the degree program.

Registration

All students must register for course work or dissertation as approved by their advisers or the departmental registration officer. After the first registration for this work, registration must be continuous unless withdrawal is allowed by the departmental committee in charge of the degree program.



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financial information

FINANCIAL OBLIGATIONS

Tuition

Tuition rates and all fees are subject to revision by the President and the Board of Trustees at any time. However, any change in tuition and fees will become effective at the beginning of the school year which follows the one in which the change was announced.

The tuition rate for graduate students in the School of Engineering is \$135 per quarter hour of credit. Doctoral candidates actively utilizing the resources of the University in their Doctor of Philosophy or Doctor of Engineering dissertation are charged an additional \$600 per quarter. Those doctoral candidates registered for dissertation work to be performed off campus are charged \$200 per quarter in addition to tuition. Degree candidates that are no longer full-time students yet still need to complete thesis or dissertation requirements will be charged a continuation fee. This will entitle the student to limited access of various University facilities and privileges.

Tuition statements are mailed to students by the Bursar's Office and are payable by cash or check to Northeastern University on or before the date specified.

Fees

A \$25 nonrefundable application fee must accompany the application for admission to the Graduate School of Engineering. No applications will be processed until the fee has been received.

Upon notification of acceptance, all full-time applicants are required to pay a tuition deposit of \$50. This deposit will be credited to the student's tuition, and it is not refundable for those who do not register.

Other fees include a charge of \$50 for late payment of tuition and a commencement fee of \$25 for all degree candidates, payable before commencement by the date listed in the academic calendar.

For full-time students there is a charge of \$12.50 per quarter for the services available in the Student Center. The fee for teaching assistants and research fellows is \$6.25 each quarter. All part-time students on the Huntington Avenue Campus are charged \$.75 a quarter.

All full-time students pay a nonrefundable University Health Service fee of \$220 each year. This fee will provide Blue Cross-Blue Shield coverage and entitle the students to the medical care furnished by the University Health Services.

All financial obligations to the University must be discharged by graduation.

Upon acceptance, graduate international students new to Northeastern University are required to pay a one-time fee of \$100.

Refunds

Tuition refunds will be granted only on the basis of the date appearing on the official withdrawal form filed by the student. Nonattendance does not constitute official withdrawal. Questions regarding refunds should be discussed with the Bursar's Office.

Refunds will be granted in accordance with the following schedule:

Amount of Refund:

Official Withdrawal Filed Within:	Percentage of Tuition
First week of quarter	100
Second week of quarter	75
Third week of quarter	50
Fourth week of quarter	25

FINANCIAL AID

The Office of Financial Aid offers two types of Federal assistance to graduate students: the National Direct Student Loan and Work-Study. All awards are based on financial need. Aid granted from these programs sponsored by the Federal Government is dependent upon the amount of funds allocated to Northeastern University.

Northeastern University is a participant in the Graduate and Professional School Financial Aid Service (GAPSFAS). All applicants for financial aid must file a GAPSFAS form in order to be considered for financial aid. This form may be obtained from the financial aid officer at the institution which the student now attends or from the Northeastern University Office of Financial Aid. All sections of the GAPSFAS form must be completed and sent to the Graduate and Professional School Financial Aid Service, Box 2614, Princeton, New Jersey 08540. Applicants for financial aid must also file the Northeastern University Graduate School Financial Aid Application and the Financial Aid Transcript; both forms may be obtained from the Office of Financial Aid.

To meet the financial aid application deadline (April 15 for fall quarter) students may have to apply for financial aid before they have been offered admission into the Graduate School. Those students must notify the Office of Financial Aid of the date of their acceptance.

Only complete applications will be reviewed for financial aid. A complete application contains:

1. a notarized Graduate School Financial Aid Application.
2. a GAPSFAS Form from Princeton, containing both the student's and the parents' financial information.

3. a Financial Aid Transcript from every college or university the student has attended.
4. notification of the student's admission into the Graduate School.

The University does not award financial assistance to students who are not citizens or permanent residents of the United States.

National Direct Student Loan

This program is available to full-time graduate students who show a high level of financial need. Graduate students may borrow up to \$12,000 during the course of their educational careers. Repayment and interest do not begin until six months after the student ceases to carry at least a half-time academic load. Repayment may be extended over a ten year period with an interest rate of five percent per annum. No payments are required for up to three years while a borrower is serving in the Armed Forces, Peace Corp, VISTA, or while working as a full-time volunteer for a tax-exempt charitable organization.

College Work-Study Program

This program is available to full-time graduate students who show financial need. It is designed to give students an opportunity to earn as much as \$5.00 per hour working in jobs on or off campus in public or private nonprofit organizations. This program is administered solely by the Office of Financial Aid and should not be confused with the University's Cooperative Education Program.

Guaranteed Student Loan Program

Under this program, students whose families have adjusted gross incomes under \$30,000 may borrow money for educational expenses from banks or other private lending institutions. Students whose families have adjusted gross incomes which exceed \$30,000 may also borrow if they can show financial need in accordance with guidelines established by the U.S. Department of Education. Students must be enrolled on at least a half-time basis to be eligible for these loans. Terms and conditions of these loans vary from state to state. Repayment, which begins six months after the student ceases to carry at least a half-time load, may be extended for as long as ten years. The interest rate during repayment is nine percent per annum. No payments are required for up to three years while the borrower is serving in the Armed Forces, Peace Corps, VISTA, or while working as a full-time volunteer for a tax-exempt charitable organization. Information and applications are available from lenders, state guarantee agencies, and regional offices of the U.S. Department of Education. Massachusetts residents may contact the Office of Financial Aid for more information.

SCHOLARSHIPS

Northeastern University Fellowships (NUF)

These fellowships are to assist a limited number of students accepted for full-time study in the Graduate Schools of the University. The awards are made to students who demonstrate superior academic achievement and are competitive within each graduate school. Stipends cover tuition and fees. Applications may be obtained from the Graduate School Office.

Martin Luther King, Jr., Scholarship

A limited number of full-time Martin Luther King, Jr., Scholarships are available. These Scholarships pay the recipient's full tuition and fees during the course of satisfactory graduate work. Further information and applications are available at the African-American Institute, Northeastern University, 40 Leon Street, Boston, Massachusetts 02115.

Please Note: This information is current as of the date of publication. All federal programs are subject to change. Please check with the Office of Financial Aid to determine the status of Financial Aid programs at the time you plan to enroll.

ASSISTANTSHIPS

The Graduate School of Engineering has available the following types of assistantships and fellowships for support of graduate students. Those interested in financial aid must apply through the chairman of the major department. The chairmen or representatives of the Department are listed in the catalog under the Committee on Graduate Study in Engineering.

Appointments to fellowships and assistantships are ordinarily announced no later than April 15 for the following academic year or summer. Appointments are for a maximum of one year and are not automatically renewed. Students who hold assistantships and research fellowships are expected to devote full time to their studies and the duties of the grant. They may not accept outside employment without the consent of their faculty advisers and the director of the graduate school.

Teaching Assistantships

A limited number of teaching assistantships are available in all departments. Teaching assistantships offer graduate students the opportunity to receive a tuition scholarship (maximum tuition remission of 6 quarter hours per quarter). A stipend is also awarded with the assistantship to students who, in return, devote half time to academic assistance directly related to the teaching function. Students receiving such awards are expected to devote the balance of their time to course work.

Graduate Administrative Assistantships

Graduate Administrative Assistantships offer graduate students the opportunity to receive a tuition scholarship (maximum tuition remission of 6 quarter hours per quarter). A stipend is also awarded to students who, in return, devote half time to assisting the department in nonteaching, administrative duties.

Research Fellowships

A number of departments offer research fellowships, including N.I.H. and N.S.F., which provide students the opportunity to receive a tuition scholarship. A stipend is also awarded to students who, in return, do research in the department. Certain of these grants require half-time work on research in the department, with the remaining time devoted to course work. Others provide for full-time work on research used for thesis or dissertation.

Doctoral Research Fellowships

In the departments which give work leading to the Ph.D. degree, research fellowships may be available for students who have established candidacy for the Ph.D. degree.

Northeastern University Tuition Assistantship (NUTA)

A limited number of tuition assistantships are available offering remission of tuition to full-time students assisting ten hours a week in the administrative work of the department. These awards are normally given to students in the first year of graduate work. Students should note that the value of the tuition received via this type of assistantship is taxable. Applications may be obtained from the Graduate School Office.

Residence Hall Staff Positions

A limited number of residence staff positions in housing facilities are available each year. Appointments carry a minimum compensation of room and board. Further information may be obtained from the Office of University Housing, 104-106 Ell Building.

ACCEPTANCE CONDITIONS

Northeastern University, which is a member of the Council of Graduate Schools of the United States, subscribes to the following resolution of the Council:

Acceptance of an offer of financial aid (such as a graduate scholarship, fellowship, traineeship, or assistantship) for the next academic year by an actual or prospective graduate student completes an agreement which both student and graduate school expect to honor. In those instances in which the student accepts the offer before April 15 and subsequently desires to withdraw, the student may submit in writing a resignation of the appointment at any time through April 15. However, an acceptance given or left in force after April 15 commits the student not to accept another offer without first obtaining a written release from the institution to which a commitment has been made. Similarly, an offer by an institution after April 15 is conditional on presentation by the student of the written release from any previously accepted offer.

faculty

George Adams, B.S., M.S., Ph.D., *Assistant Professor of Mechanical Engineering*
 Charles T. Ajamian, B.S., M.S., Ph.D., *Lecturer in Engineering*
 Edward Alstshuler, B.S., M.S., Ph.D., *Lecturer in Engineering*
 Reginald L. Amory, B.C.E., M.C.E., Ph.D., *Professor of Civil Engineering*
 Paul C. Barr, B.E.E., *Lecturer in Engineering*
 Geoffrey N. Berlin, B.S., M.S., Ph.D., *Assistant Professor of Industrial Engineering*
 Frederick C. Blanc, B.S., M.S., Ph.D., *Professor of Civil Engineering*
 Paul H. Blinco, B.S., M.S., Ph.D., *Lecturer in Civil Engineering*
 Charles O. Bolthrunis, B.S., B.S., S.T.B., *Lecturer in Chemical Engineering*
 H. Frederic Bowman, B.S., M.S., Nuc.E., Ph.D., *Associate Professor of Bio-Medical Engineering*
 George H. Brattin, B.S., M.S., *Instructor of Civil Engineering*
 Allan S. Bufferd, B.S., M.S., D. Sc., *Lecturer in Engineering*
 Ralph A. Buonopane, B.S., M.S., Ph.D., *Associate Professor of Chemical Engineering*
 Stanley T. Burak, B.S., *Lecturer in Engineering*
 Michael J. Burke, B.S., M.S., M.B.A., *Lecturer in Civil Engineering*
 Leroy M. Cahoon, B.S., M.S., *Associate Professor of Civil Engineering*
 Marcello J. Carrabes, B.S., M.S., *Associate Professor of Electrical Engineering*
 Richard I. Carter, B.S., M.S., *Associate Professor of Information Systems*
 William Carter, B.S., M.S., *Lecturer in Engineering*
 John H. Cashman, B.S., M.S., *Lecturer in Engineering*
 Sam. P. Chaudhuri, B.E.E.E., M.E.E.E., Ph.D., *Lecturer in Engineering*
 Stephen Ching, B.S., Ph.D., *Lecturer in Engineering*
 John W. Cipolla, Jr., B.S., M.S., Ph.D., *Professor of Mechanical Engineering*
 John J. Cochrane, B.S., M.S., Ph.D., *Professor of Civil Engineering*
 Basil L. Cochrun, B.S., M.S., *Professor of Electrical Engineering*
 Menashi D. Cohen, B.S., M.S., Ph.D., *Assistant Professor of Civil Engineering*
 Jerome J. Connor, Jr., S.B., S.M., Sc.D., *William Lincoln Smith Professor and Chairman of the Civil Engineering Department*
 Thomas Cullinane, B.S., M.S., *Associate Professor Industrial Engineering*
 Cameron H. Daley, B.S., M.S., *Lecturer in Engineering*
 Siben Dasgupta, B.S., M.S., *Lecturer in Engineering*
 Foster J. DeGiacomo, B.S., *Lecturer in Engineering*
 Anthony J. Devaney, B.S., M.S., Ph.D., *Lecturer in Engineering*
 Joseph DiGiovanni, B.S., J.D., *Lecturer in Civil Engineering*
 James G. Dolan, B.S., *Lecturer in Engineering*
 Ladislav Dolansky, Ing., M.S., E.E., Ph.D., *Professor of Electrical Engineering*
 Elisabeth M. Drake, S.B., Sc.D., *Cabot Corporation Professor and Chairperson of the Chemical Engineering Department*
 Charles Drane, B.S., S.M., Ph.D., *Lecturer in Engineering*
 John F. Dunn, Jr., S.B., S.M., Sc.D., *Professor of Mechanical Engineering*
 James M. Feldman, B.S., M.S., Ph.D., *Professor of Electrical Engineering*
 Melvin D. Field, B.S., S.M., Sc.D., *Lecturer in Engineering*
 Samuel Fine, B.S., M.S., M.D., *Professor of Electrical Engineering and Chairman of Bio-Medical Engineering*
 Arthur R. Foster, B.S., M.Engg., *Professor of Mechanical Engineering*
 Clifford J. Fralen, B.S., M.S., *Lecturer in Engineering*
 David R. Freeman, B.S., M.S., Ph.D., *Professor of Industrial Engineering*
 Peter G. Furth, B.S., M.S., Ph.D., *Assistant Professor of Civil Engineering*

Maurice Gertel, B.S., M.S., *Lecturer in Engineering*
 Lewis Geyer, B.S., M.S., Ph.D., *Professor of Industrial Engineering*
 J. Duncan Glover, B.S., M.S., Ph.D., *Assistant Professor of Electrical Engineering*
 Kenneth I. Golden, B.S., S.M., M.E., Ph.D., *George A. Snell Professor of Engineering*
 David S. Goldman, B.S., M.S., *Lecturer in Engineering*
 Robert A. Gonsalves, B.S., M.S., Ph.D., *Professor of Electrical Engineering*
 Bernard M. Goodwin, B.S., Sc.D., *Associate Professor of Chemical Engineering*
 Alexander M. Gorlov, Engineer, Ph.D., *Associate Professor of Mechanical Engineering*
 Arvin Gabel, B.E.E., M.E.E., Sc.D., *Professor of Electrical Engineering*
 Constantine J. Gregory, B.A., M.S., Ph.D., *Professor of Environmental Sciences*
 Richard E. Grojean, B.S., M.S., *Associate Professor of Electrical Engineering*
 David Gronewold, B.S., M.S., *Lecturer in Engineering*
 Edward M. Gulachenski, B.S., M.S., *Lecturer in Engineering*
 Surendra Gupta, B.E.E.E., M.S.I.E., M.B.A., Ph.D., *Associate Professor of Industrial Engineering and Information Systems*
 Edgar B. Gutoff, B.Ch.E., S.M., Sc.D., *Lecturer in Chemical Engineering*
 Peter K. Hadley, B.S., M.S., *Instructor of Civil Engineering*
 Pamela Halpern, B.A., M.S., *Instructor in Information Systems*
 Donald Harahy, B.S., M.S., *Lecturer in Engineering*
 Robert L. Harvey, B.S., M.S., Ph.D., *Lecturer in Engineering*
 David Heimann, B.S., M.S., *Lecturer in Engineering*
 Stewart V. Hoover, B.S., M.S., Ph.D., *Associate Professor of Industrial Engineering*
 Thomas C. Houston, B.S., M.U.A., M.S., *Lecturer in Civil Engineering*
 Thomas E. Hulbert, B.M.E., M.S., *Associate Professor of Industrial Engineering*
 Magdi T. IsHak, B.S., M.S., *Lecturer in Engineering*
 Walter E. Jaworski, B.S., M.S., D.Sc., *Associate Professor of Civil Engineering*
 Paul A. Kales, B.S., M.S., *Lecturer in Engineering*
 Martin Kaliski, B.S., M.S., Ph.D., *Professor of Electrical Engineering*
 Arthur Kantrowitz, B.S., M.S., Sc.D., *Adjunct Professor*
 Israel Katz, B.S., M.M.E., *Professor in Engineering Technology*
 Wayne G. Kellner, B.S., S.M., Sc.D., *Associate Professor of Electrical Engineering*
 Thomas J. Kerr, B.S., M.S., Ph.D., *Lecturer in Engineering*
 McKeen Kessel, B.S., *Lecturer in Engineering*
 Pamidipula Kotiveeriah, B.S., M.S., Ph.D., *Lecturer in Engineering*
 Gregory J. Kowalski, B.S., M.S., Ph.D., *Assistant Professor of Mechanical Engineering*
 Michael Kupferman, B.S., M.S., Ph.D., *Associate Professor of Civil Engineering*
 Robert J. Lechner, B.S., M.S., Ph.D., *Associate Professor in Electrical Engineering*
 Kenneth M. Leet, B.S., M.S., D.Sc., *Professor of Civil Engineering*
 Edward F. Levell, B.S., M.S., *Lecturer in Engineering*
 Thomas Litrenta, B.S., M.S., Ph.D., *Lecturer in Engineering*
 Walter H. Lob, B.S., M.S., *Associate Professor of Electrical Engineering*
 Robert F. London, A.B., M.B.A., *Lecturer in Engineering*
 Bertram S. Long, B.S., M.S., M.E., *Associate Professor of Mechanical Engineering*
 Thomas J. Macdonald, B.S., M.S., *Lecturer in Engineering*
 John D. Macey, B.S., M.S., *Lecturer in Engineering*
 Robert N. Martin, B.S., M.S., *Associate Professor of Electrical Engineering*
 David W. McDougall, B.S., M.S., *Lecturer in Civil Engineering*
 William J. Meehan, B.S., M.E., *Lecturer in Engineering*
 Herbert Meiselman, B.S., M.S., Ph.D., *Lecturer in Engineering*
 Emanuel Melachroudis, B.S., M.S., Ph.D., *Assistant Professor in Industrial Engineering*
 Robert L. Meserve, B.S., M.S., *Associate Professor of Civil Engineering*
 Mohammad Metghalchi, B.S., M.S., ScD., *Assistant Professor of Mechanical Engineering*
 Marvin M. Miller, B.S., M.A., Ph.D., *Lecturer in Engineering*
 Ernest E. Mills, B.S., M.S., *Associate Professor of Mechanical Engineering and Mechanical Engineering Technology*
 James D. Murphy, B.S., *Lecturer in Engineering*
 Jeremiah Murphy, B.S., M.S., *Lecturer in Civil Engineering*

- Paul J. Murphy, B.S., M.S., *Lecturer in Engineering*
 Richard J. Murphy, B.S., M.S., Ph.D., *Professor of Mechanical Engineering*
 Saul Namyet, S.B., *Associate Professor of Civil Engineering*
 J. David Naparstek, A.B., Sc.M., *Lecturer in Civil Engineering*
 Swami Narayanan, B.S., B. Tech., M. Tech., Ph.D., *Lecturer in Chemical Engineering*
 Warren G. Nelson, S.B., S.M., Sc.D., *Associate Professor of Mechanical Engineering*
 Robert A. Nery, B.S., *Lecturer in Engineering*
 David W. Noones, B.S., M.S., *Lecturer in Engineering*
 Welville B. Nowak, S.B., Ph.D., *Donald W. Smith Professor of Engineering*
 James C. O'Shaughnessy, B.S., M.S., Ph.D., *Associate Professor of Civil Engineering*
 Alan S. Parkes, B.A., Ph.D., *Lecturer in Engineering*
 Hormoz Pazwash, B.S., M.S., Ph.D., *Associate Professor of Civil Engineering*
 Syed Peeran, B.E., M.E., Ph.D., *Lecturer in Engineering*
 Ronald F. Perry, B.S., M.S., Ph.D., *Associate Professor of Industrial Engineering*
 Thomas E. Phalen Jr., B.S., M.S., *Associate Professor of Mechanical Engineering Technology*
 Nathan Phillips, B.S., M.S., *Lecturer in Engineering*
 William C. Pisano, B.C.E., M.S., S.M., Ph.D., *Lecturer in Civil Engineering*
 Richard Platcow, B.S., M.S., *Lecturer in Engineering*
 Stephen L. Priest, B.S., M.S., *Lecturer in Engineering*
 John G. Proakis, B.S., M.S., Ph.D., *Professor of Electrical Engineering*
 Harold R. Raemer, B.S., M.S., Ph.D., *Professor of Electrical Engineering*
 Wilfred J. Remillard, B.S., M.S., Ph.D., *Professor of Electrical Engineering*
 George O. Reynolds, B.S., M.S., *Lecturer in Engineering*
 William J. Roache, B.S., M.S., *Lecturer in Civil Engineering*
 J. Spencer Rochefort, B.S., M.S., *Professor of Electrical Engineering and Chairman of the Department*
 Michael Rudko, B.S., M.S., Ph.D., *Associate Professor of Electrical Engineering*
 John N. Rossettos, B.S., M.S., Ph.D., *Professor of Mechanical Engineering*
 Khalid Saeed, M.Eng., *Lecturer in Engineering*
 Gerald D. Saks, B.M.E., M.B.A., *Lecturer in Engineering*
 Sheldon S. Sandler, B.S., M.Eng., M.A., Ph.D., *Professor of Electrical Engineering*
 Malukutla Sarma, B.S., M.S., Ph.D., *Professor of Electrical Engineering*
 Gerhard O. Sauermann, B.S., M.S., Ph.D., *Lecturer in Engineering*
 Martin Schetzen, B.E.E., S.M., Sc.D., *Professor of Electrical Engineering*
 Mikkail Schiller, B.S., M.S., *Lecturer in Civil Engineering*
 John K. Schindler, S.B., S.M., Ph.D., *Lecturer in Engineering*
 John G. Schoon, M.S., Ph.D., *Associate Professor of Civil Engineering*
 Walter C. Schwab, S.B., S.M., Ph.D., *Professor of Electrical Engineering*
 Richard J. Scranton, B.S., M.S., *Associate Professor of Civil Engineering*
 Mohammad Shishizaz, B.S., M.S., *Instructor in Mechanical Engineering*
 Michael B. Silevitch, B.S., M.S., Ph.D., *Professor of Electrical Engineering*
 Irwin Silverstein, B.S., M.S., *Instructor in Civil Engineering*
 John M. Slepetz, B.C.E., M.C.E., Ph.D., *Lecturer in Engineering*
 Barkev Siroonian, B.A., M.S.P.H., M.S., *Lecturer in Civil Engineering*
 Charles A. Steele, Jr., A.B., A.M., M.S., M.A.Sc., *Lecturer in Engineering*
 Richard R. Stewart, B.S., M.S., Ph.D., *Associate Professor of Chemical Engineering*
 Christopher Stiehl, B.S., M.S., *Lecturer in Engineering*
 Robert D. Stuart, M.A., Ph.D., *Professor of Electrical Engineering*
 Robert L. Sullivan, B.S., M.S., Ph.D., *Assistant Professor of Mechanical Engineering*
 Lawrence Symington, B.S., M.S., Ph.D., *Lecturer in Engineering*
 Ahmet Talug, B.S., M.S., Ph.D., *Assistant Professor of Mechanical Engineering*
 Barbara Baum Taylor, B.S., S.M., Ph.D., *Associate Professor of Civil Engineering*
 Robert M. Torbin, B.S., M.S., *Lecturer in Civil Engineering*
 Thomas Vasilos, B.S., Sc.D., *Lecturer in Engineering*
 Anthony J. Venuti, B.S., M.B.A., *Lecturer in Engineering*
 Steven J. Wallach, B.S., M.S., M.B.A., *Lecturer in Engineering*
 Sidney Wartel, B.S., M.S., J.D., *Lecturer in Civil Engineering*
 Irvine W. Wei, B.S., M.S., Ph.D., *Associate Professor of Civil Engineering*

Lin-Jyh Weng, B.S., M.S., Ph.D., *Lecturer in Engineering*
John A. Williams, B.S., M.S., Ph.D., *Professor of Chemical Engineering*
John L. Williams, B.S., M.S., Ph.D., *Assistant Professor of Mechanical Engineering*
Bernie T. Woodrow, B.S., M.S., *Lecturer in Engineering*
Mishac K. Yegian, B.S., M.S., Ph.D., *Associate Professor of Civil Engineering*
Alvin J. Yorra, B.S., M.S., *Associate Professor of Mechanical Engineering*
Ibrahim Zeid, B.S., M.S., Ph.D., *Assistant Professor of Mechanical Engineering*
Joseph J. Zelinski, B.S., Ph.D., *Professor of Mechanical Engineering*
John Zotos, B.S., M.S., Met.E., *Associate Professor of Mechanical Engineering*

civil engineering

Admission

To be enrolled for graduate work leading to the degree of Master of Science in Civil Engineering, applicants must have obtained a Bachelor of Science degree in Civil Engineering, with an acceptable quality of undergraduate work, from a recognized institution. Applicants with a Bachelor of Science degree from a recognized institution in some other engineering field or related science and an appropriate background of preparation may pursue this program and qualify for the degree of Master of Science.

THE MASTER'S DEGREE

General

The master's degree requirements can be completed on the Cooperative Plan, on a full-time basis or part-time in the evening. Forty quarter hours of academic work are required. A master's report carrying 4 q.h. of credit, or a thesis of 8 q.h. credit is required in all programs (environmental, structural, transportation, geotechnical, and construction).

A meaningful sequence of electives must be chosen which meets the approval of the department. Department interviews are necessary early in the program for all students in order that an approved program of electives may be arranged with the individual.

Full-Time Program on the Cooperative Plan

The full-time program on the Cooperative Plan may be pursued on either the alternating or parallel schedules. Both programs require a minimum of an eighteen-month commitment for completing degree requirements. Students who are admitted to a Masters Degree program under the Cooperative Plan must complete, through satisfactory performance, each cooperative work assignment to be eligible for the degree. Please refer to section describing the regulations of the graduate school for a more complete description of the cooperative education programs.

Continuous Full-Time Programs

Students may take academic work on a continuous full-time basis and complete degree requirements in one academic year. The sequence of courses which students take on this plan is established by their adviser.

Part-Time Programs

The admission requirements for these programs are similar to those for the full-time program, but students may progress according to their ability to com-

bine their study load with their employment load. A maximum of seven years is allowed to complete the program.

Substitutions

With the approval of the department, substitutions may be made for some of the prescribed courses by other courses in the department or in other departments which offer graduate work.

STRUCTURAL ENGINEERING

The Structural Engineering Program emphasizes basic courses in Structural Analysis, Design of Steel and Concrete Structures, Soil Mechanics, and Foundation Engineering. Advanced topics in Dynamics and Stability and Numerical Methods round out a comprehensive presentation which may be supplemented by offerings from other programs, such as mechanical engineering or industrial engineering. Courses in Probability and Systems Analysis are also available from other Civil Engineering programs.

SPECIMEN FULL-TIME PROGRAM

Fall Quarter		Credits
1.847	Advanced Structural Mechanics (Days)	4
1.853	Concrete Structures I	2
1.861	Design of Structures I	2
1.871	Soil Mechanics I	2
1.882	Engineering Geology ('83-'84 academic year)	2
1.886	Soil Dynamics I	2
		<u>14</u>
		(Minimum)

Winter Quarter		Credits
1.854	Concrete Structures II	2
1.862	Design of Structures II	2
1.872	Soil Mechanics II	2
1.887	Soil Dynamics II	2
1.890	Numerical Methods in Civil Engineering (Days)	4
1.993	Master's Report	4
	or	
1.991	Thesis	8
		<u>14</u>
		(Minimum)

Spring Quarter		Credits
1.850	Seismic Design	2
1.851	Selected Topics in Earthquake Engineering ('82-83 Academic Year)	2
1.855	Concrete Structures III	2

1.859	Stability ('83-'84 academic year)	2
1.863	Design of Structures III	2
1.878	Foundation Engineering (Days)	4
	(Minimum)	12

PART-TIME PROGRAM

Required Courses		Credits
1.993	Master's Report	4
	or	
1.991	Thesis	8
	(Minimum)	4

Electives (Part-time Program)

Students in the Structural Engineering major must elect 30 quarter hours from civil engineering courses within the structural engineering field.

Six quarter hours may be elected from any courses in engineering or science for which the student has the necessary preparation.

The electives will normally be available according to the following schedule:

Fall Quarter		Credits
1.841	Advanced Structural Mechanics I	2
1.853	Concrete Structures I	2
1.861	Design of Structures I	2
1.871	Engineering Properties of Soils I	2
1.874	Foundation Engineering I ('82-'83 academic year)	2
1.882	Engineering Geology ('83-'84 academic year)	2
1.886	Soil Dynamics I	2
1.888	Numerical Methods in Civil Engineering I	2

Winter Quarter		Credits
1.842	Advanced Structural Mechanics II	2
1.854	Concrete Structures II	2
1.862	Design of Structures II	2
1.872	Engineering Properties of Soils II	2
1.875	Foundation Engineering II ('82-'83 academic year)	2
1.884	Rock Mechanics I ('83-'84 academic year)	2
1.887	Soil Dynamics II	2
1.889	Numerical Methods in Civil Engineering II	2

Spring Quarter		Credits
1.843	Finite Element Analysis of Structures I	2
1.849	Model Analysis	2

1.850	Seismic Design	2
1.851	Selected Topics in Earthquake Engineering ('82-'83 academic year)	2
1.855	Concrete Structures III	2
1.859	Stability ('83-'84 academic year)	2
1.863	Design of Structures III	2
1.876	Foundation Engineering III ('82-'83 academic year)	2
1.885	Rock Mechanics II ('83-'84 academic year)	2

TRANSPORTATION ENGINEERING

The Transportation Engineering Program is designed for students with career goals in transportation engineering, planning, or research. This program may consist of courses from engineering, liberal arts, and business. A minimum of 40 credit hours is required for a graduate degree and may be obtained on a part-time or full-time schedule.

A Master of Science in Civil Engineering degree will be awarded to students who have an accredited undergraduate degree in civil engineering and have completed at least 24 credit hours in civil engineering courses, i.e. courses designated with 01.- numbers. A Master of Science degree will be awarded to qualifying students who do not have an undergraduate degree in civil engineering or who do not meet the minimum 24 credit hour requirement in civil engineering courses. A student may elect to take nontechnical electives in arts and sciences and business administration. A maximum of nine credit hours in nontechnical fields will be allowed.

A typical program of study would normally consist of courses shown in the specimen program. Substitution for the courses listed in the specimen program may be made depending on the student's interests, academic background and career objectives. Each student is expected to consult with his faculty adviser to develop an approved program of study.

For a complete listing of courses and course descriptions, consult appropriate sections of the graduate school catalogues for Engineering, Arts and Sciences, and Business Administration. Further information can be obtained within this catalogue under *Graduate Program in Transportation*, which describes the interdisciplinary program in transportation leading to a Master of Science in Transportation degree.

SPECIMEN PROGRAM

Required Courses		Credits
1.807	Systems Analysis I	2
1.808	Systems Analysis II	2
1.813	Traffic Flow Theory I	2
1.814	Traffic Flow Theory II	2
1.835	Theory and Practice of Transportation Planning I	2
1.836	Theory and Practice of Transportation Planning II	2

1.916	Engineering Statistics I	2
1.917	Engineering Statistics II	2
1.993	Master's Report	4
	or	
1.991	Thesis	8

Suggested Technical Electives

Courses	Credits
1.207 Technology Assessment	4
1.809 Systems Analysis III	2
1.811 Urban Public Transportation	2
1.815 Urban Transportation Analysis I	2
1.816 Urban Transportation Analysis II	2
1.817 Traffic Engineering	2
1.820 Transportation Engineering	2
1.865 Environmental Impacts of Transportation I	2
1.866 Environmental Impacts of Transportation II	2
5.916 Engineering Analysis Utilizing Data Processing	2
5.960 Probability and Statistics I	2
5.961 Probability and Statistics II	2
5.962 Probability and Statistics III	2
5.913 Data Processing for Engineers	2
5.914 Advanced Operations Research	4

Suggested Non-Technical Electives

Courses	Credits
22.847 The Politics of Transportation	3
39.9L5 Economics of Urban Transp.	3
39.9P3 Regional Development	3
39.9R1 Development Planning	3
22.842 Techniques of Urban Planning	3
22.841 Problems in Urban Planning	3
39.9L7 Economics of Inter-City Transportation	3
48.805 Urban Transportation	3
48.801 Seminar in Intercity Transportation	3
39.9L1 Urban Economics I	3
39.9L2 Urban Economics II	3

ENVIRONMENTAL ENGINEERING

Includes areas of specialization such as water resources engineering, water and wastewater engineering, environmental health, air pollution control and solid waste management.

Part-time students and full-time students not on traineeships or grants-in-aid have the option of undertaking either a Master's Report for 4 q.h. credit or a Master's Thesis for 8 q.h. credit. (Students on traineeships or with grants-in-aid may be required to complete a Master's Thesis.)

Suggested programs for both full-time and part-time students are given below. Other programs, tailored to meet individual requirements, may be developed through conferences with the student's adviser.

SPECIMEN DAY PROGRAM

Fall Quarter		Credits
1.914	Water & Wastewater Treatment	4
*1.923	Environmental Chem.	4
1.933	Environmental Anal.	4
	Elective	<u>2</u>
		14

Winter Quarter		Credits
1.912	Water & Wastewater Treatment III	2
1.922	Env. Bacteriology	2
	Electives	<u>10</u>
		14

Spring Quarter		Credits
	Electives	4 or 8
1.993	Master's Report	4
	or	
1.991	Thesis	<u>8</u>
	(Minimum)	12

PART-TIME PROGRAM

Required Courses		Credits
1.910	Water & Wastewater Treatment I	2
1.911	Water & Wastewater Treatment II	2
1.912	Water & Wastewater Treatment III	2
*1.920	Env. Chemistry I	2
*1.921	Env. Chemistry II	2
1.922	Env. Bacteriology	2
1.930	Env. Analysis I	2
1.931	Env. Analysis II	2

* These required courses may be waived for those students who have taken Northeastern course 1.923, Environmental Chemistry, or equivalent. Course 1.933 or courses 1.930 and 1.931 will be required of all students.

1.993	Master's Report	4
	or	
1.991	Thesis	8
		20 or 24

Elective Groupings (Day and Part-Time)

Forty (40) quarter hours of academic work are required for the degree, including certain approved electives which are available from other departments. To provide a meaningful grouping of the available technical electives, one of the following sequences of courses must be selected. These are the required courses for each area of specialization. A minimum of 14 quarter hours of elective courses must be obtained from the environmental engineering courses offered by the Civil Engineering Department. Exceptions to these requirements must receive permission from the Environmental Engineering Graduate Committee.

Water and Wastewater Engineering		Credits
1.913	Industrial Waste Disposal	2
1.916	Engineering Statistics I	2
1.935	Unit Operations In Environmental Engineering I	2
1.936	Unit Operations in Environmental Engineering II	2
1.954	Stream Sanitation	2
	Additional Electives	6 or 10

Environmental Health Engineering & Science		Credits
1.985	Environmental Protection	2
1.980	Environmental Planning and Management	2
1.940	Public Health Engineering Survey	2
1.950	Air Pollution Engineering	2
1.952	Industrial Hygiene	2
1.955	Air Sampling and Analysis	2
	Additional Electives	4 or 8

Water Resources Engineering		Credits
1.888	Numerical Methods in Civil Engineering I	2
1.902	Open Channel Flow I	2
1.903	Open Channel Flow II	2
1.908	Hydrology I	2
1.909	Hydrology II	2
1.916	Engineering Statistics I	2
1.917	Engineering Statistics II	2
1.924	Flow Through Porous Media	2
1.925	Groundwater and Seepage	2
1.963	Hydraulic Structures I	2
1.964	Hydraulic Structures II	2
1.965	Water Resources Planning	2

Air Pollution Engineering**Credits**

1.807	Systems Analysis I	2
1.808	Systems Analysis II	2
1.950	Air Pollution	2
1.955	Air Sampling & Analysis	2
1.957	Air Pollution Science	2
	Additional Electives	6 or 10

GEOTECHNICAL ENGINEERING

At the master's degree level, students may concentrate their studies in Geotechnical Engineering. This option is open only to those students who have an accredited undergraduate degree in Civil Engineering. Those without a Civil Engineering degree may enter the program only after completing a series of undergraduate Civil Engineering courses which will provide the necessary background. The extent of the undergraduate courses required for admission will depend on each individual's academic background.

Students electing the Geotechnical major must undertake either a Master's Report or Thesis and take twenty-six quarter hours of Civil Engineering courses within the Geotechnical Engineering field. The remaining 6 to 10 quarter hours of study may be elected from any offering in either Engineering or Science for which the student has the necessary prerequisites. Each student must elect the technical electives during the first year of study and have them approved by his academic adviser.

Required Courses**Credits**

1.850	Seismic Design I	2
1.851	Selected Topics in Earthquake Engineering	2
1.871	Soil Mechanics I	2
1.872	Soil Mechanics II	2
1.873	Soil Mechanics III	2
1.874	Foundation Engineering I	2
1.875	Foundation Engineering II	2
1.876	Foundation Engineering III	2
1.882	Engineering Geology	2
1.884	Rock Mechanics I	2
1.885	Rock Mechanics II	2
1.886	Soil Dynamics I	2
1.887	Soil Dynamics II	2

Suggested Electives**Credits**

1.888	Numerical Methods in Civil Engineering I	2
1.889	Numerical Methods in Civil Engineering II	2
1.849	Model Analysis	2

1.916	Engineering Statistics I	2
1.917	Engineering Statistics II	2
1.924	Flow Through Porous Media	2
1.925	Groundwater and Seepage	2
1.963	Hydraulic Structures I	2
1.964	Hydraulic Structures II	2
1.908	Hydrology I	2
1.909	Hydrology II	2
1.830	Construction Methods and Equipment I	2
1.831	Construction Methods and Equipment II	2
1.832	Legal Aspects of Civil Engineering I	2
1.833	Legal Aspects of Civil Engineering II	2

CONSTRUCTION ENGINEERING

This major consists of core courses primarily from the Civil Engineering Department. It is filled out with electives from the Civil Engineering, Industrial Engineering, and Engineering Management Departments, or from the Graduate School of Business Administration. Each student is required to prepare a program of study which must be reviewed and approved by a faculty adviser. Required courses are indicated in the program which follows. Program options emphasize technical, systems, or business aspects of Construction Engineering. Part-time students are subject to the same requirements as full-time students.

FULL-TIME PROGRAM

Fall Quarter

1.830	Construction Methods and Equipment I	2
1.832	Legal Aspects of Civil Engineering I	2
1.821	Cost of Construction Projects	2
5.810	Accounting for Engineers	2
	Electives	4
		<u>12</u>

Winter Quarter

1.822	Planning and Control of Construction Activities	2
1.831	Construction Methods and Equipment II	2
5.841	Engineering Project Management	2
1.833	Legal Aspects of Civil Engineering II	2
	Electives	6
		<u>14</u>

Spring Quarter

1.827	Construction Seminar	2
5.809	Advanced Engineering Economy	2
1.993	Master's Report	4
	or	
1.991	Thesis	8
	Electives	or 6
		14

PART-TIME PROGRAM

Part-time students are subject to the same requirement as full-time students. Some of the courses are not available in the evening, but appropriate substitutions may be made if students are given formal written approval by an academic adviser.

Elected Courses:

1. Students interested in a *Technical Emphasis* may choose from any appropriate Civil Engineering course or other engineering courses to fill out his or her program. This program must be approved by a faculty adviser.

2. Students interested in either a *Systems Engineering* or *Business Management Emphasis* would normally be expected to take 1.916, 1.917, 1.807–1.809, as appropriate to their programs and then choose the remaining requirements (up to a limit of 10 quarter hour credits) from courses in Industrial Engineering or the School of Business Administration such as:

Systems Engineering Emphasis	Credits
5.912 Network Planning and Control	2
5.817 Advanced Work Design	2
or	
5.823 Advanced Production Analysis	4
5.904 Queuing Theory and Its Applications	2
5.905 Analysis with Simulation	2
5.916 Engineering Analysis Utilizing Data Processing	2
5.954 Advanced Quality Control	2
5.963 Statistics II	2
5.940 Basic Information System Technology	2
5.941 Management Information Systems	2
5.942 MIS: Planning, Control, and Development	2
or	
49.918 Information Theory and Systems	3*
49.932 Introduction to Computer Applications	3*
49.933 Management Information Systems	3*

Business Management Emphasis

41.862	Tax Factors in Business Decisions	3*
45.965	Management of Small Business Enterprises	3*
45.968	Management of New Enterprises	3*
5.805	Industrial Budgeting for Engineers	2
45.972	Labor Relations	3*
5.862	Introduction to Occupational Health and Safety	2
5.863	Technical Aspects of Health and Safety	2
45.993	Labor Law	3*

THE DOCTOR'S DEGREE**Environmental Engineering
Full-Time Program**

The following material outlines the procedures for admission to the doctoral program in environmental engineering and the steps necessary to qualify for the Ph.D. degree. For further information applicants should write to the Chairman of the Ph.D. Committee, Department of Civil Engineering.

Admission

Each student admitted to the program will initially have the status of doctoral student. In the usual case, he will have received a master's degree in an appropriate field of engineering or science prior to entry into the program. Applicants should apply to the Chairman of the Ph.D. Committee, Department of Civil Engineering for admission to the doctoral program, preferably by February 1st. The Committee will interview the applicants, examine their records, and decide whether they should be admitted to the program. The chairman of the department will appoint a program adviser for each doctoral student, upon the recommendation of the Ph.D. Committee.

Residence Requirement

The residence requirement is satisfied by one year of full-time graduate work after admission as a doctoral student. However, it is expected that at least two years of full-time graduate study will be required beyond the master's degree.

Degree Candidacy

Degree candidacy is established in accordance with the general graduate school regulations. At least one year of full-time study and successful completion of the qualifying examination are required for consideration as a doctoral degree candidate.

* The amount of credit applied toward the degree must be established by the Department.

Qualifying Examination

The qualifying examination will consist of a written and an oral section. The written part will cover: (1) environmental engineering and/or science and (2) selected areas depending upon the educational background and interest of the student. In certain cases the student may be exempted from the written part of the examination. The oral portion will measure general comprehension. If the oral examination is failed, it may be repeated with permission of the departmental graduate committee. The qualifying examination shall be completed no later than two years after admittance as a doctoral student. After successful completion of this examination the student will be given the status of doctoral candidate.

Comprehensive Examination

The comprehensive examination is given after the thesis has been completed. This examination is based upon the defense of the thesis.

Course Requirements

Course requirements for each applicant will be determined by the Ph.D. Committee. Formal course work will be selected to meet the individual student's objectives. Graduate level study up to 12 quarter hours of course work completed under programs other than this full-time program may be accepted with approval of the committee.

Thesis

After degree candidacy has been established, a candidate must complete a thesis which embodies the results of extended research and includes material suitable for publication.

A thesis committee will be appointed by the chairman of the Ph.D. Committee. The thesis committee, consisting ordinarily of five members, two of whom are from other departments, will be informed of the progress of the thesis and will be responsible for its approval.

Language Requirement

A reading knowledge of one foreign language is required. The requirement shall be determined in a manner prescribed by the committee, and must be satisfied prior to taking the oral qualifying examination.

mechanical engineering

The Department of Mechanical Engineering offers the degrees of Master of Science in Mechanical Engineering, Mechanical Engineer, and Doctor of Philosophy. The Master of Science degree can be pursued on either a full-time or a part-time basis. A full-time student may apply for participation in the Co-operative Plan. The Mechanical Engineer and Doctor of Philosophy degrees are pursued on a basis consistent with the residence requirements for the degree. The curriculum offers areas of concentration in Mechanics, Thermofluid Engineering, and Materials Science and Engineering.

THE MASTER OF SCIENCE DEGREE

Admission

To be enrolled for graduate work leading to the degree of Master of Science in Mechanical Engineering, applicants must have obtained from a recognized college or university the degree of Bachelor of Science in Mechanical Engineering, or a closely-allied engineering field, with an acceptable quality of undergraduate work. Applicants with a Bachelor of Science degree in other engineering or related science fields and an appropriate background of preparation may pursue this program and qualify for the degree of Master of Science without specification.

Area of Concentration

Each student must complete the required courses in one area of concentration to be eligible to receive the degree. It is expected that these courses will be completed as early as possible in his academic program. The elective courses in each area of concentration should be chosen with the aid of the student's adviser.

Required Courses

Mechanics		Credits
2.826	Math. Methods for Mech. Eng. I	2
2.827	Math. Methods for Mech. Eng. II	2
2.804	Theory of Elasticity	2
	and	
2.805	Theory of Elasticity	2
	or	
2.819	Fluid Dynamics I	2
	and	
2.820	Fluid Dynamics II	2
2.841	Vibration Theory	2
	and	

2.842	Vibration Theory	2
	or	
2.849	Automatic Cont. Eng.	2
	and	
2.850	Automatic Cont. Eng.	2
	and	
2.851	Automatic Cont. Eng.	2
		<u>12 or 14</u>

Thermofluid Engineering**Credits**

2.826	Math. Methods for Mech. Eng. I	2
2.827	Math. Methods for Mech. Eng. II	2
2.819	Fluid Dynamics I	2
2.820	Fluid Dynamics II	2
2.901	Adv. Thermodynamics	2
2.902	Adv. Thermodynamics	2
2.910	Conduction Heat Trans.	2
2.911	Convection Heat Trans.	2
		<u>16</u>

Materials Science and Engineering**Credits**

2.826	Math. Methods for Mech. Eng. I	2
2.827	Math. Methods for Mech. Eng. II	2
2.954	Adv. Physical Met. I	2
2.956	Adv. Physical Met. II	2
2.970	Mat. Sci. and Eng.	2
2.971	Mat. Sci. and Eng.	2
2.804	Theory of Elasticity	2
	or	
2.960	Thermo. of Materials	2
	and	
2.961	Thermo. of Materials	2
		<u>14 or 16</u>

In addition, Seminar (2.990 and 2.998) and Thesis (2.991) are required for continuous full-time and cooperative plan students in all areas of concentration.

Electives

Students must take sufficient mechanical engineering departmental electives so that the required courses in their major area and the departmental electives total at least 30 of the 40 quarter hours required for the degree.

The remaining ten credits may be elected from any courses in engineering or science for which the student has the necessary preparation.

Full-Time Program on the Cooperative Plan

The cooperative program may be taken on an alternating or parallel schedule as set forth under the regulations of the Graduate School. Placement in a work assignment is not guaranteed by the University since placement is a function of the availability of positions and the academic background and job-related experience of students.

The thesis, seminar, and specified courses are the same as required by the continuous full-time program.

Continuous Full-Time Program

Students may take the 40 quarter hours of academic work on a continuous full-time basis. A thesis of ten quarter hours of credit and two seminar courses are required of all continuous full-time students in addition to the specified courses in an area of concentration. The sequence of courses which students take on this plan is established by their adviser.

Part-Time Program

The admission and graduation requirements for the evening part-time program are the same as for the full-time program, but students may progress according to their abilities and the time available. All courses in one area of concentration must be completed by part-time students. The thesis and seminar courses are not required.

Advisers for Part-Time Programs

The following faculty members of each area of concentration should be contacted if information is required relative to any academic problems.

Mechanics	Professor John N. Rossettos
Thermofluid Engineering	Professor Warren G. Nelson
Materials Science and Engineering	Professor Richard J. Murphy

THE MECHANICAL ENGINEER DEGREE

The degree of Mechanical Engineer is offered for those who wish to undertake graduate study beyond the Master's degree without committing themselves to a program as extensive as that required for the Doctor's degree. The degree permits a candidate to pursue a course of study at the upper graduate level in more than one area of Mechanical Engineering as distinguished from the specialization usually associated with the doctoral program.

The following material outlines the requirements for the Mechanical Engineer degree. For further information applicants should write to the Chairman of the Graduate Committee, Department of Mechanical Engineering, Northeastern University, Boston, Massachusetts 02115.

Admission

To be admitted to candidacy for the degree of Mechanical Engineer, the applicant will have obtained the degree of Master of Science in Mechanical Engineering, or its equivalent, from a recognized institution. In some cases, where the Master's degree is not in Mechanical Engineering, the applicant may be admitted to the program on a conditional basis with the stipulation that certain deficiencies be removed without credit toward the degree. Such special admission is dependent upon the approval of the Mechanical Engineering Graduate Committee.

In general, an applicant will choose two areas of concentration to give him the broad background which characterizes the degree of Mechanical Engineer. An outline of his program must be submitted to the Graduate Committee for approval before final action can be taken upon his application. It is recommended that the applicant discuss his program with the Graduate Committee and members of the graduate faculty in his areas of concentration prior to submission of his program for approval.

Each applicant must submit to the Graduate Committee prior to March 1: (1) transcripts of his undergraduate and graduate records, (2) three letters of recommendation which indicate his ability to carry out advanced graduate work, and (3) the program of study which he proposes to follow.

Classification and Degree Candidacy

A student admitted to the Mechanical Engineer degree program will be designated as a Candidate for this degree. The Candidate's adviser normally will be the faculty member who will supervise the dissertation.

Residence Requirement

The residence requirement is satisfied by two academic quarters of full-time graduate work during the academic year or by four academic quarters of half-time graduate work during two consecutive academic years. Plans for satisfying the residence requirement on a half-time basis must be approved by the Graduate Committee.

Qualification and Examinations

A student must maintain a 3.00 grade point average to qualify for the degree. Students admitted on a conditional basis may be required to pass special examinations. The Graduate Committee will determine the need for and will administer any such special examinations. A final oral examination consisting of a defense of the dissertation may be required if the Candidate's adviser and the Departmental Graduate Committee so decide.

Credit Requirements

A minimum of 40 quarter hours of credit beyond the Master's degree is required. Up to 10 quarter hours of credit will be permitted for work on a

dissertation. A minimum of 20 quarter hours of credit must be in the Mechanical Engineering Department.

Dissertation

To be awarded the Mechanical Engineer degree, each candidate must complete a dissertation demonstrating a high level of competence in research, development, or design in the field of Mechanical Engineering. The effort normally expected will be the equivalent of 10 quarter hours of graduate course work.

Transfer Credits

Any transfer of credits must be approved by the Mechanical Engineering Graduate Committee.

Time Limitation

After admission to the program, a maximum of five years will be permitted for completion of the degree.

Registration

After approval of the Candidate's program, registration must be continuous. Withdrawal or changes in the program must be approved by the Graduate Committee.

THE DOCTOR OF PHILOSOPHY DEGREE

The degree of Doctor of Philosophy is awarded to those candidates who demonstrate high attainment and research ability in the field of Mechanical Engineering.

The following material outlines the requirements for the Doctor of Philosophy degree. For further information applicants should write to the Chairman of the Department of Mechanical Engineering, Northeastern University, Boston, Massachusetts 02115.

Admission

The program leading to the Ph.D. degree is open to persons who are candidates for the Master of Science in Mechanical Engineering degree as well as those who have received the degree. Requests for admission to the program should be made to the Chairman of the Department of Mechanical Engineering. Applicants will receive an application for interview form. This form, along with transcripts of all undergraduate and graduate work and three letters of recommendation, must be returned to the Chairman of the Graduate Committee of the Department of Mechanical Engineering by November 1. The applicant will be notified of an interview time. Based upon an evaluation of applicants'

qualifications, the Graduate Committee will inform applicants whether or not they will be admitted to the program.

Residence Requirement

The residence requirement is satisfied by one year of full-time graduate work or by two years of half-time graduate work beyond the Master's degree. However, a student should expect to spend at least two years, or the equivalent, in full-time graduate study beyond the requirements of the Master's degree.

Degree Candidacy

After 40 quarter hours of graduate work have been taken with satisfactory grades and upon successful completion of the qualifying examination, a student is established as a degree Candidate.

Qualifying Examination

The qualifying examination in the Department of Mechanical Engineering is offered yearly in January and is both written and oral. The written portion of the qualifying examination is six hours in length and covers, with equal emphasis, four different areas. A student must select one area from each of the three groups A, B, and C, plus another area either listed below or unlisted, but considered equivalent and approved by the Graduate Committee.

- A. Concepts of Thermodynamics**
Applied Thermodynamics
- B. Dynamics**
Mechanics of Deformable Bodies
- C. Heat and Mass Transfer**
Fluid Mechanics
Mechanical Behavior of Materials
Physical Metallurgy

The oral portion of the qualifying examination is conducted by a committee consisting of at least four members appointed by the Graduate Committee. A typical committee is composed of two members specializing in the student's major area plus one member from each of two other areas.

The qualifying examination may be taken by a graduate student who expects to complete the requirements for his Master's degree within three months of the date of the qualifying examination as well as by a person who has already completed the requirements for the Master's degree. Because degree candidacy must be established before the Graduate Committee will act to approve course programs or dissertation proposals, the qualifying examination should be taken at the earliest opportunity. If the examination is failed, it may be repeated with permission of the departmental Graduate Committee.

Course Requirements

To receive the Ph.D. degree a candidate must complete a program of course work approved by the Graduate Committee. Courses completed prior to admittance to the doctoral program are subject to the approval of the Graduate Committee. Each program must contain at least twelve quarter hours of course work, preferably outside of the department, in an area other than that in which the candidate is concentrating. Attainment of a 3.00 grade point average for the courses in the "minor" portion of the program will signify satisfactory completion of that portion.

Dissertation

After degree candidacy has been established, a candidate must complete a dissertation which embodies the results of extended research and includes materials suitable for publication.

The departmental Graduate Committee may require the completion of certain course work before permitting dissertation work to commence. A Dissertation Committee will be appointed by the Chairman of the department upon the recommendation of the departmental Graduate Committee. The Dissertation Committee will be kept informed of the work and will be responsible for initial approval of the dissertation in its final form.

Language Requirement

A reading knowledge of one foreign language is required. Proficiency in a language shall be determined in a manner prescribed by the departmental Graduate Committee. The language requirement must be fulfilled within six months after the dissertation proposal has been accepted but no less than six months before the degree is granted.

Comprehensive Examination

The comprehensive examination is combined with the final oral examination and is given after the dissertation has been completed and approved. This examination is based upon the subject matter of the dissertation and a defense of it.

Final Oral Examination

The final oral examination is taken after completion of all other requirements for the degree. This examination cannot be held until two weeks have elapsed after the dissertation has been registered and accepted by the Graduate School and must be passed at least two weeks before the commencement at which the degree is to be awarded.

The final oral examination will include the subject matter of the doctoral dissertation and significant developments in the field of the dissertation work. Other fields may be included if recommended by the examining committee.

electrical engineering

Admission

To be enrolled for graduate work leading to the degree of Master of Science in Electrical Engineering, applicants must have obtained a Bachelor of Science degree in Electrical Engineering, with an acceptable quality of undergraduate work, from a recognized college or university. Applicants with a Bachelor of Science degree in other engineering or related science fields and an appropriate background of preparation may pursue this program and qualify for the degree of Master of Science without specification. In some cases, students whose Bachelor of Science degree is in some other engineering or related science field may qualify for the degree of Master of Science in Electrical Engineering. This requires special approval of the Department of Electrical Engineering.

THE MASTER'S DEGREE

Full-Time Program on the Cooperative Plan

The full-time program on the Cooperative Plan may be pursued on either the alternating or parallel schedules. Both programs require a minimum of an eighteen-month commitment for completing degree requirements. Students who are admitted to a Master's degree program under the Cooperative Plan must complete, through satisfactory performance, each cooperative work assignment to be eligible for the degree. Please refer to the section describing the regulations of the Graduate School for a more complete description of the cooperative education programs.

Continuous Full-Time Programs

Students may take academic work on a continuous full-time basis and complete degree requirements in one academic year. The sequence of courses which students take on this plan is established by their adviser.

GENERAL PROGRAM

Full-Time Course Requirements

Electrical Engineering

Forty quarter hours of academic work are needed for a Master's degree. The following courses are required of all full-time students:

Required Courses

3.823	Mathematical Methods in Electrical Engineering	4
3.827	Linear Systems Analysis	4

3.832	Network Synthesis	4
3.842	Linear Active Circuits	4
3.877	Electromagnetic Theory	4
3.902	Applied Prob. and Stoch. Processes	4
3.990	Seminar I	2
3.991	Seminar II	<u>2</u>
		28

A limited amount of work may be elected from the part-time program.

A thesis for six quarter hours credit is elective with the approval of the chairman of the department. If the thesis option is approved, this work is done in the second year of the program. Details concerning thesis proposals, editorial format, and time schedules are available in the Graduate School Office.

The program of each student will be made up from the required and elective courses available in each term and approved by the student's academic adviser.

POWER SYSTEMS MAJOR

The Electrical Engineering Department offers a variety of graduate courses which may be of interest to those designing, operating, and maintaining electric energy systems. Since the program is utilized primarily by part-time M.S. students, the courses are offered at night and on a staggered schedule. Some of the more specialized topics listed are offered only on demand, so students interested in such offerings are encouraged to make their wishes known.

Students wishing to major in Power Systems may petition to take 3.926-27 (Power Circuit Analysis) in place of 3.840-41 (Linear Active Circuits). Both are normally offered yearly. Otherwise, the course requirements are essentially the same for Power Systems as for any of the other major areas. The student's attention is directed to the requirements for major and minor areas described under Electives (see page 66). Courses listed there under the Power Systems heading include offerings from both Electrical Engineering and Mechanical Engineering. All of the courses so listed may be used in either a *major* or a *minor* as appropriate. For any other courses outside of Electrical Engineering, specific prior approval is required. It is always advisable to get approval for a complete program of study before beginning any part thereof. For students majoring in Power Systems, the appropriate approval may be obtained from the Director of the Power Systems Program.

Full-Time Program on the Cooperative Plan

The full-time program on the Cooperative Plan may be pursued either on the alternating or parallel schedules. Students who are admitted to a Master's degree program under the Cooperative Plan must complete, through satisfactory performance, each cooperative work assignment to be eligible for the degree. Please refer to the section stating the regulations for the Graduate School for a more complete description of the cooperative education programs. The course requirements may vary with a student's background; deviations to

the program previously described may be made in consultation with your adviser.

Continuous Full-Time Program

Students may take academic work on a continuous full-time basis and complete degree requirements in one academic year. The sequence of courses which students are required to complete will be made in consultation with an adviser.

Part-Time Program Electrical Engineering

Admission

The admission requirements for the part-time program leading to the degree of Master of Science in Electrical Engineering are the same as for the full-time program, but students may progress according to their abilities and the time available.

All graduate courses presuppose mastery of the subject matter of a modern, fully accredited curriculum in electrical engineering. Applicants who have not taken further academic work for some time since they received their bachelor's degree may be required to take graduate courses to satisfy any deficiencies. For this purpose, the following courses are available:

Prerequisite Courses	Credits
3.975 Precs of Modern Electrical Engineering I	2
3.976 Precs of Modern Electrical Engineering II	2
3.977 Precs of Modern Electrical Engineering III	2
3.978 Precs of Modern Electrical Engineering IV	2

These courses carry graduate credit but a maximum of four quarter hours of credit from this group may be used as elective credit in the degree program.

Program

Forty quarter hours of academic work are required for the master's degree of which 16 quarter hours of credit are specified as follows:

Required Courses	Credits
3.825 Linear Systems Analysis II	2
3.826 Linear Systems Analysis III	2
3.840 Linear Active Circuits I	2
3.841 Linear Active Circuits II	2
3.875 Electromagnetic Theory I	2
3.876 Electromagnetic Theory II	2

3.8C1	Mathematical Methods in Electrical Engineering I	2
	and	
3.8C2	Mathematical Methods in Electrical Engineering II	2
	or	
3.8C4	Mathematical Methods in Electrical Engineering III	2
	and	
3.8C5	Mathematical Methods in Electrical Engineering IV	2
	or	
3.900	Applied Probability and Stochastic Processes I	2
	and	
3.901	Applied Probability and Stochastic Processes II	2

Students lacking the necessary prerequisites for 3.8C1 or 3.8C4 may be required to take undergraduate courses 3.292 or 3.293 to clear this deficiency. By petition, these courses may carry graduate credit.

Electives

In addition to the required course work each student is expected to select a major and a minor area from the list given below. Ten quarter hours of credit must be taken in the major area and six quarter hours of credit taken in the minor area. The area or areas to which a course is assigned is indicated in the following listings. Not every course is assigned to an area. They may be used as one of the free elective courses. Eight quarter hours of credit are free electives which may be selected from graduate courses in sciences or other engineering departments for which the student has the necessary preparation.

Subject Areas

1. Circuits and Systems

3.830		3.911
3.831		3.912
3.832	3.843	3.950
3.833	3.845	3.951
3.834	3.860	3.952
3.835	3.861	3.953
3.837	3.910	3.954

2. Computer Science

3.837	3.8T0	3.937	3.986
3.860	3.8T2	3.966	3.987
3.861	3.8T3	3.967	3.988
3.893	3.8T7	3.968	3.989
3.894	3.8T8	3.969	3.9A1
3.895	3.8T9	3.972	3.9A2
3.898	3.8U4	3.973	3.9B1
3.899	3.8U7	3.974	3.9D1
3.8A1	3.935	3.979	3.9E1
3.8T1	3.936	3.985	3.9E2

3. Fields, Waves and Optics

3.800	3.817	3.890	3.923
3.801	3.818	3.891	3.980
3.802	3.819	3.913	3.981
3.806	3.878	3.914	3.982
3.807	3.879	3.915	3.983
3.808	3.880	3.916	3.984
3.810	3.881	3.917	
3.811	3.882	3.921	
3.812	3.883	3.922	

4. Communications and Control

3.817	3.898	3.908	3.965
3.818	3.899	3.909	3.9A1
3.819	3.900	3.9C1	3.9A2
3.865	3.901	3.9C2	3.9A6
3.866	3.902	3.957	3.9A7
3.867	3.903	3.958	3.9A8
3.871	3.905	3.959	
3.872	3.906	3.963	
3.873	3.907	3.964	

5. Physical Electronics

3.806	3.808	3.854	3.8G2
3.807	3.853	3.8G1	3.8G3

6. Power Systems

2.901	2.942	3.931	3.942
2.902	2.943	3.932	3.944
2.920	2.944	3.933	3.945
2.921	3.925	3.935	3.955
2.935	3.926	3.936	3.956
2.936	3.927	3.940	
2.938	3.930	3.941	

Quarter-Sequence Courses

Certain courses have an A or B after the course title. In these cases, credit will be given toward the degree only if both the A and B courses are successfully completed.

COMPUTER SCIENCE MAJOR

The Computer Science Program is structured to provide a curriculum of study in computer science and engineering leading to the degree of Master of Science in Electrical Engineering, or Master of Science, with a major in Computer Science.

Admission

To be enrolled for this degree program, applicants must have obtained a Bachelor of Science degree in engineering, mathematics, or the physical sciences from a recognized college or university and must present satisfactory evidence of ability to pursue graduate study. Students who do not hold a Bachelor of Science degree in Electrical Engineering may be required to complete an appropriate undergraduate prerequisite program to be determined at the time of acceptance.

Program

Forty quarter hours of academic work are required, of which 14 are specified and 26 are elective.

Specified Courses**Credits**

3.893	Digital Computer Programming I	2
3.894	Digital Computer Programming II	2
3.972	Digital Computer Design I-A	2
3.973	Digital Computer Design I-B	2
3.8A1	Mathematical Methods in Computer Science	2
3.8T1	Numerical Methods and Computer Applications I	2
3.8T2	Numerical Methods and Computer Applications II	2

Electives

Sixteen quarter hours of credit must be chosen from the following list of courses. It is urged that students take both of the courses in any two-quarter sequence they elect, and at least two courses in any three-quarter sequence they elect.

- 3.837 Introduction to Graph Theory
- 3.895 Digital Computer Programming III
- 3.898 Combinatorial & Optimization Techniques I
- 3.899 Combinatorial & Optimization Techniques II
- 3.8T3 Numerical Methods and Computer Applications III
- 3.8T7 Digital Signal Processing I
- 3.8T8 Digital Signal Processing II
- 3.9A1 Error Correcting Coding I
- 3.9A2 Error Correcting Coding II
- 3.9E1 Compiler Construction I-A *
- 3.9E2 Compiler Construction I-B *
- 3.908 Special Topics in Communication Theory
- 3.966 Switching Theory I
- 3.967 Switching Theory I-A *
- 3.968 Switching Theory I-B *
- 3.969 Switching Theory II
- 3.974 Digital Computer Design II
- 3.985 Fundamentals of Language and Machine Theory I
- 3.986 Fundamentals of Language and Machine Theory II
- 3.987 Fundamentals of Language and Machine Theory III
- 3.988 Special Topics in Computer Science
- 3.989 Computer Peripherals
- 3.995 Thesis
- 3.998 Special Problems in Electrical Engineering
- 5.911 Linear Programming
- 5.916 Engineering Analysis Utilizing Data Processing
- 5.941 Management Information Systems

Students must take sufficient electrical engineering departmental courses to total 30 of the 40 quarter hours required for the degree.

Thesis

A thesis carrying six credits may be elected with the approval of the chairman of the department. If the thesis option is approved, this work is done in the second half of the program.

* Both A and B courses must be successfully completed to receive credit.

THE DOCTOR'S DEGREE

Full-Time Program

The following material outlines the procedures for admission to the doctoral program and the steps necessary to qualify for the Ph.D. degree. For further information applicants should write to the Secretary, Department of Electrical Engineering.

Admission

Students who are interested in pursuing a doctor's program, should contact the **Electrical Engineering Department** to request an application. Completed applications, together with transcripts of all prior work and two letters of recommendation, should be forwarded to the Electrical Engineering Department, 409 Dana Hall, no later than January 1 of the preceding year. Following evaluation of this material, the applicant will be informed whether or not he will be permitted to undertake the qualifying examination. A personal interview is not required, but a student may arrange with the Secretary of the Electrical Engineering Graduate Committee, Professor Robert N. Martin (617-437-3041), for an appointment for further program details if desired. A student who has received approval to take the qualifying examination is considered a pre-doctoral student until such time as he passes the examination. **Upon successful completion of the qualifying examination he becomes a Ph.D. candidate.**

Residence Requirement

The residence requirement is satisfied by one year of full-time graduate work or two consecutive years of part-time graduate work. In the latter case, a detailed time schedule must be approved by the student's adviser in order to give evidence that at least half of the time is being devoted to the requirements of the graduate school program.

Qualifying Examination

First, and foremost, the Ph.D. Qualifying Examination is the entrance examination for admission to the doctoral program. In addition, this examination has the dual purpose of one: serving as an indicator of the student's capability for successful completion of the program, and two: serving as a guide to his adviser in developing a suitable plan of study tailored to the individual needs of the candidate.

With these goals in mind, the candidate is urged to take the qualifying examination early in his graduate program (i.e., not later than the successful completion of 40 quarter hours of graduate work).

The examination is composed of a written and an oral part, and is usually given in the spring quarter of each academic year. The written part covers the following general categories:

- (1) Circuits and Electronics

- (2) Fields, Waves, and Energy Conversion
- (3) Systems
- (4) Miscellaneous Topics in Electrical Engineering

The oral part is designed to test general comprehension. Together, the oral and written portions of the examination review the factual knowledge of a typical undergraduate Electrical Engineering program and the understanding of that material from a more mature point of view.

If the examination is failed it may be repeated only with permission of the Graduate Committee upon recommendation of the Ph.D. Qualifying Examination Committee.

Comprehensive Examination

Within three years of his establishment of degree candidacy, the student will be required to demonstrate by means of a comprehensive examination a subject matter knowledge satisfactory for the award of the degree.

The comprehensive examination is an oral examination open to the Electrical Engineering faculty (assistant professor and above in rank) and administered by the student's Thesis Committee. Departmental faculty will be informed of the examination via a departmental notice at least one week prior to the examination. Normally the examination will be given at the time the Thesis Proposal is submitted to the Thesis Committee for approval. As part of this examination the Thesis Committee will review the student's doctoral program and his performance in graduate courses, as well as examine the student on subject matter related to his graduate studies and his thesis area.

Course Requirements

Successful completion of a doctoral program normally requires a minimum of 70 quarter hours of satisfactory graduate level work beyond the B.S. degree, exclusive of doctoral seminar (required), doctoral reading, and doctoral thesis.

The course work must include a three-course sequence (graduate level) in each of two minor areas. Both minors must be in science, applied science, or a related area. One minor may be chosen from an area of electrical engineering outside the candidate's proposed major area.

Thesis

The candidate's thesis research shall be directed by his Thesis Adviser, whom he shall select upon establishing candidacy. The Thesis Committee shall approve the thesis in final form.

Language Requirement

The language requirement may be satisfied in French, German, or Russian, with an additional option of English for Ph.D. candidates for whom English is

not the native language. * Information on these exams may be obtained from the Department Office, 411 Dana.

Final Oral Examination

This examination will be held in accordance with the departmental regulations.

THE ELECTRICAL ENGINEER DEGREE

The Department of Electrical Engineering offers the graduate professional degree usually known as the Engineer Degree. This degree, offered at a number of institutions, usually requires about one year of full-time graduate study beyond the master's degree. The official title of the degree is "Electrical Engineer".

The following material outlines the procedures for admission to the Electrical Engineer degree program and the steps necessary to qualify for the degree. For further information applicants should write to the Department of Electrical Engineering.

Admission

A master's degree in engineering or a related field with a better than 3.00 grade point average and the approval of the departmental graduate committee is required for admission. In some cases, where the master's degree is not in Electrical Engineering, a student may be admitted to the program with the stipulation that certain preparation be completed without credit toward the degree.

The applicant must complete the following documentation:

1. An application form (apply to the E.E. Dept. office)
2. Two letters of recommendation
3. Transcripts of all college-level work
4. A written statement setting forth the student's educational and career goals
5. Results of the Test of English as a Foreign Language (TOEFL) examination for international students.

Applications must be completed and on file no later than January 1 of the preceding year. An interview will be scheduled with a faculty member prior to the final review by the Graduate Committee. Graduate Committee reviews will be held some time during the spring quarter.

The Engineer Degree is available on either a full- or a part-time basis.

Classification and Degree Candidacy

A student admitted to the Engineer Degree program will be designated as a candidate for this degree.

* Only with written permission of candidate's adviser.

Residence Requirement

The residence requirement is satisfied by two academic quarters of full-time graduate work during the same academic year or part-time graduate work during a period of two consecutive academic years subject to approval of adviser.

Qualification and Examinations

A student must maintain a 3.00 grade point average and receive no "F's" in order to qualify for the degree. In some instances, a student may be required to take special examinations. Such examinations will be determined in each case by the departmental graduate committee.

Course Requirements

The minimum course requirements are 40 quarter hours beyond the master's degree. No more than 10 out of the 40 quarter hours of credit are allowed for thesis and special problems combined. A minimum of 20 quarter hours must be taken in regularly scheduled electrical engineering subjects. The student's course program must be approved by the adviser.

Dissertation

Each engineer degree student must complete a dissertation which demonstrates a high level of competence in research, development, or design in the field of electrical engineering. Thesis registration must total at least 6 quarter hours of graduate work. In no case will more than 10 quarter hours be credited towards the degree requirements.

In some cases a master's thesis of superior quality may be used to satisfy the thesis requirement. The thesis supervisor has responsibility for acceptance of the thesis.

Prior to submission of the thesis for acceptance the student must make a thesis presentation to be arranged by the adviser, who will provide reasonable notice to all Electrical Engineering faculty and others who may be interested. The thesis supervisor has responsibility for acceptance of the thesis.

Language Requirement

No foreign language is required for the Electrical Engineer degree.

Final Oral Information

A final oral examination consisting of a defense of the dissertation may be required if the student's adviser or the departmental graduate committee so decide.

Transfer of Credits

Approval for transfer of credit may be given by the departmental graduate committee upon written request from the student. Such requests should be

submitted at the time of application to the program. A maximum of 10 quarter hours of credits may be transferred from another school but transfer credits for thesis are not allowed.

Time Limitation

After admission to the program, a maximum of three years will be allowed for completion of the degree requirements. Extension of this time limit may be granted by the departmental graduate committee.

Registration

All candidates must register for a **minimum** of 4 quarter hours of course work **each** quarter as approved by their academic adviser. After initial registration, registration must be continuous unless withdrawal is approved by the departmental graduate committee.

chemical engineering

The Department of Chemical Engineering offers the degrees of Master of Science in Chemical Engineering, Doctor of Engineering, and Doctor of Philosophy. The Master of Science degree may be pursued on either a full-time or a part-time basis. A full-time student may apply for participation in the Co-operative Plan. The Doctor of Engineering and Doctor of Philosophy degrees are pursued on a basis consistent with the residence requirements for the degree.

THE MASTER'S DEGREE

Admission

To be enrolled for graduate work in Chemical Engineering, applicants usually have obtained a Bachelor of Science degree in Chemical Engineering, with an acceptable quality of undergraduate work from a recognized college or university. However, qualified students with other B.S. or B.A. degrees in science or engineering may be admitted. Such students are required to complete supplementary undergraduate work in addition to the usual M.S. program in order to qualify for the M.S. degree in Chemical Engineering. Complete programs for these students are worked out after the student has made formal application to the program through the Graduate School of Engineering. The undergraduate work required is strongly dependent on the mathematics, chemistry, and engineering background of the applicant. The undergraduate course work in such programs may not be used for degree credit and must be pursued on a full-time (non-cooperative education) basis.

Full-Time Program on The Cooperative Plan

The full-time program on the Cooperative Plan may be pursued either on the alternating or parallel schedule. Both programs require a minimum of an eighteen month commitment for completing degree requirements. Students who are admitted to a Masters degree program under the Cooperative plan must complete, through satisfactory performance, each cooperative work assignment to be eligible for the degree. Please refer to section stating the regulations of the Graduate School for a more complete description of the Cooperative Education programs.

Continuous Full-Time Programs

Students may take academic work on a continuous full-time basis and complete degree requirements in one academic year. The sequence of courses which students take on this plan is established by their adviser.

Credit and Course Requirements

The Master of Science degree in Chemical Engineering is awarded to students who have satisfactorily completed an approved program of forty quarter hours of correlated work of graduate caliber. A minimum of thirty quarter hours of credit must come from graduate course offerings in Chemical Engineering. At least six of the Chemical Engineering courses must carry four quarter hours of credit. All four quarter hour courses offered by the department except those involving individual (project-type) work are acceptable in meeting this requirement. Research Techniques I and II (4.833 and 4.834) and/or M.S. Thesis (4.991) are required only for students who wish to pursue the department's doctoral programs. However, these courses may be taken by other students when their career objectives deem them advisable. Courses taken outside the department which are to be used for degree credit must be approved in advance by the department's graduate adviser.

Chemical Engineering Electives

At least two Chemical Engineering Electives will be scheduled each academic quarter. Consult the course SCHEDULE bulletin of the Graduate School of Engineering for the offerings in the current academic year. Possible offerings are:

Fall Quarter:

- 4.802 Chemical Engineering Mathematics
- 4.829 Chemical Process Control
- 4.870 Polymer Science
- 4.890 Heterogeneous Catalysis

Winter Quarter

- 4.811 Chemical Engineering Thermodynamics
- 4.823 Transport Phenomena
- 4.840 Advanced Management Techniques in the Chemical Industry
- 4.978 Separation Processes
- 4.974 Selected Topics in Fluid Mechanics

Spring Quarter

- 4.806 Optimization Techniques
- 4.838 Modeling and Simulation of Chemical Processes
- 4.845 Advanced Plant Design Concepts
- 4.850 Chemical Process Pollution Control (Water)
- 4.973 Chemical Process Heat Transfer
- 4.891 Kinetics of Chemical Processes

PART-TIME PROGRAM

The admission requirements for this program are the same as for the full-time program, but students may progress according to their ability to combine their study with their employment. This program is open only to students who possess a B.S. degree in Chemical Engineering. The credit and course requirements for this program are the same as for the full-time cooperative program. The department will offer two 4 quarter hour graduate courses in the late afternoon time period to assist part-time students in meeting degree requirements. A maximum of seven years is allowed for completion of this program.

Students wishing to switch their status from part-time to full-time M.S. candidates must notify the Chemical Engineering Department and make formal application with the Graduate School of Engineering. Such requests are usually granted for the full-time program to begin in the fall quarter.

THE DOCTOR OF PHILOSOPHY DEGREE

The following material outlines the procedure for admission to the doctoral program and the steps necessary to qualify for the Ph.D. degree. For further information applicants should write to the Chairman of the Department of Chemical Engineering.

Admission

Applicants who are enrolled as candidates for the degree of Master of Science in Chemical Engineering at Northeastern University should apply in writing to the Chairman of the Department of Chemical Engineering for admission to the doctoral program. Such application must be made by April first of the year in which they expect to receive the master's degree. The departmental graduate committee will examine the record of the applicant and decide whether or not he should be allowed to take the qualifying examination.

Applicants who are enrolled for graduate work at other institutions or who have completed the requirements for the master's degree should write the chairman of the department for an application for an interview. This form, together with transcripts of all undergraduate and graduate work, must be transmitted to the chairman of the departmental graduate committee. The applicant will be notified of an interview time and, after the interview, will be advised if he should make formal application for admission to the doctoral program. Approved applicants must submit an application for admission as a doctoral candidate and two letters of recommendation not later than April first. The applicant will be notified of the acceptance of his application and the date of the qualifying examination.

Residence Requirement

The residence requirement is satisfied by one year of full-time graduate work or two consecutive years of part-time graduate work. In the latter case, a detailed time schedule must be approved by the departmental graduate committee as

evidence that at least half of the time is being devoted to the requirements of the graduate school program. In general, it should be expected that at least two years of full-time work after establishment of degree candidacy will be necessary.

Degree Candidacy

Degree candidacy is established in accordance with the general graduate school regulations.

Qualifying Examination

The qualifying examination includes both written and oral parts and is normally given in the spring and the fall. The written examination, in general, will cover the following areas:

1. General Principles in Chemical Engineering Science
2. Thermodynamics and Stoichiometry
3. Mathematical Procedures and Kinetics
4. Specialized Technological Topics (to be announced)

The oral examination will test general comprehension.

A student may take a written examination in each area each time they are given; and may repeat a failed examination, only once, at a later offering. Successful completion of all examinations may not extend over a period greater than 13 months. Previously administered examinations will be available to formal applicants.

Comprehensive Examination

During the time in which a student is a candidate for a doctoral degree he or she may be required to demonstrate by means of a comprehensive examination a subject-matter knowledge satisfactory for the award of the degree.

Course Requirements

The course requirements in addition to the minimum requirements for establishing degree candidacy will be determined by the departmental graduate committee and the student in consultation with the committee.

Transfer credit will be dealt with on an individual basis by the departmental graduate committee in accordance with the general graduate school regulations.

Thesis

An individual may choose his thesis topic and supervisor as soon as he becomes a doctoral student. In most cases selection of topic will be made immediately after the student has established his candidacy for the Ph.D. degree. He will be expected to discuss with the staff their Ph.D. thesis topics offerings. After these discussions, the student shall notify the adviser, the de-

partment head, and the chairman of the departmental graduate committee in writing of his choice of thesis topic and adviser. The chairman of the departmental graduate committee after consultation with the thesis adviser shall appoint an appropriate thesis committee. This committee shall be kept informed of the progress of the thesis and will approve the thesis in its final form.

Language Requirement

The foreign language requirement may be satisfied by a reading knowledge in two languages selected from French, German, and Russian. The examinations are administered by the department and consist of translation from current scientific journals or textbooks.

Final Oral Examination

This examination is held in accordance with the general regulations of the graduate school.

THE DOCTOR OF ENGINEERING DEGREE

The following material outlines the procedure for admission to the doctoral program and the steps necessary to qualify for the Doctor of Engineering degree. For further information, applicants should write to the Chairman of the Department of Chemical Engineering.

Admission

Applicants for the Doctor of Engineering program must either be candidates for the Master of Science degree in Chemical Engineering or have completed the Master of Science program in Chemical Engineering.

Applicants need not have undertaken a master's thesis.

Applicants for the Doctor of Engineering degree must pass the doctoral qualifying examination given to applicants for the Doctor of Philosophy degree in this department.

Applicants must file application forms with the departmental graduate committee along with official transcripts of previous college work, and two letters of recommendation. Applicants will not be considered until all documents have been received. Applicants will be notified promptly as to whether or not they have been accepted.

Residence Requirement

The residence requirement is satisfied only by full-time residence for one academic year. This requirement must be fulfilled after successful completion of the qualifying examination and prior to the end of the five-year period set forth in the general regulations.

Degree Candidacy

Degree candidacy is established in accordance with the general graduate school regulations.

Qualifying Examination

The qualifying examination includes both written and oral parts and is normally given in the spring and the fall. The written examination, in general, will cover the following areas:

1. General Principles in Chemical Engineering Science
2. Thermodynamics and Stoichiometry
3. Mathematical Procedures and Kinetics
4. Specialized Technological Topics (to be announced)

The oral examination will test general comprehension.

A student may take any or all of the examinations in each area and may repeat a failed examination, only once, at a later offering. The taking and successful completion of all examinations may not extend over a period greater than 13 months. Previously administered examinations will be available to formal applicants.

Comprehensive Examination

During the time in which a student is a candidate for a doctoral degree he may be required to demonstrate by means of a comprehensive examination a subject-matter knowledge satisfactory for the award of the degree.

Course Requirements

The course requirements, in addition to the minimum requirements for establishing degree candidacy, will be determined by the departmental graduate committee and the student in consultation with the committee.

Transfer credit will be dealt with on an individual basis by the departmental graduate committee in accordance with the general graduate school regulations.

Engineering Problem

Engineering Problem advisers will be appointed by the departmental graduate committee. Approval of the topic for the Problem rests with the Problem adviser and the committee.

The Engineering Problem is not a research problem but rather an engineering problem in depth. It may include elements of design, economics, business management principles, and process development. In general, it will not include laboratory investigations.

Normally, the Engineering Problem will be solved on campus. Under special arrangements approved by the departmental graduate committee and the adviser, a portion of the work may be performed off campus.

Regardless of the arrangements made for the Engineering Problem, no off-campus adviser will be approved. Only the Problem adviser will specify the nature and requirements of the Problem, and the findings and results remain the property of the adviser and the University to be published as they determine.

Language Requirement

There is no foreign language requirement for this degree.

Computer Ability

Ability with computer programming must be demonstrated when required.

Final Oral Examination

This examination is held in accordance with the general graduate school regulations.

industrial engineering, engineering management, and information systems

The Department of Industrial Engineering offers the following degrees:

Master of Science in Industrial Engineering

Master of Science in Engineering Management

Master of Science in Information Systems

Industrial Engineer

Students pursuing a Master of Science degree may choose one of the following areas of concentration: -

General Program

Assurance Sciences

Computer and Information Systems

Human Factors

Operations Research

The above programs may be taken by full-time students on a continuous basis or under the co-operative or sponsorship (intern) plans as described under the "Regulations of the Graduate School of Engineering." Students pursuing the Master of Science on a part-time basis may undertake the Engineering Management programs or may take one of the Industrial Engineering concentrations with approval by the academic adviser.

Admission

To be enrolled for graduate study leading to the degree of Master of Science in Industrial Engineering or Engineering Management, the applicant must have obtained a Bachelor of Science degree in an engineering field, with an acceptable quality of undergraduate work from a recognized college or university. A limited number of applicants with a Bachelor of Science degree in mathematics or science, whose preparation is considered adequate, may be permitted to pursue either program, and, upon its completion, qualify for the degree of Master of Science without specification. The program in Information Systems is available to students of diverse academic backgrounds.

To be accepted for candidacy for the degree of Industrial Engineer, the applicant must possess the master's degree in Industrial Engineering or equivalent from a recognized institution. Further, an applicant for candidacy must have the potential capability to structure and solve complex real-world problems. Evidence of this capability may be in the form of a thesis completed as a requirement for the Master of Science Degree, or in such other form as is acceptable to the Industrial Engineering Department Graduate Committee.

Prerequisite Courses

Entrance to any of the above programs presupposes that the student has had a basic course in each of the following areas: engineering economy, probability, engineering statistics, operations research (deterministic and stochastic), computer programming (compiler language), and accounting. Recognizing that some applicants may not have taken certain of these subjects, the program offers the intensive courses listed below. At the time of admission to the program, the adviser will specify those courses on the list which the applicant must complete satisfactorily to qualify for the degree. Such specified courses are to be completed as early in the program as scheduling will permit. The courses below carry graduate credit up to a maximum of six quarter hours of elective credit toward the degree.

Course	Credits
5.808 Basic Engineering Economy	2
5.810 Industrial Accounting for Engineers	2
5.901 Operations Research I	2
5.902 Operations Research II	2
5.913 Data Processing for Engineers (FORTRAN)	2
*5.960 Probability I	2
*5.961 Probability II	2
*5.962 Statistics I	2
	16

*(Note: As of September 1976, these courses supercede 5.950 and 5.951, Statistics I and II. Students enrolled in the program prior to this date who have not satisfied a requirement of 5.950 and 5.951 should see their adviser to work out equivalent courses and credits.)

General Requirements for the Master of Science Degree

A minimum of 40 quarter hours of graduate level credit is required for any of the Master of Science programs in the Industrial Engineering Department including not more than six quarter hours of "Prerequisite or Advanced Undergraduate Courses".

The required courses for each of the general and major area programs are listed in the following pages. The remaining hours to complete each program may be considered as free electives, unless otherwise stated. These may be any graduate courses offered within the College of Engineering or the Department of Mathematics for which the student has adequate preparation. Up to six quarter hours may be elected in other graduate schools with the approval of the student's faculty adviser and of the director of the graduate school offering the desired course. Students should consult the catalogs of the Graduate Schools of Business Administration, Arts and Sciences, or other programs. The

amount of credit applied toward the degree will be established by the student's adviser.

MASTER OF SCIENCE IN INDUSTRIAL ENGINEERING

General Program

The general program in Industrial Engineering is designed to provide an opportunity for the engineer to study contemporary industrial engineering techniques as practiced in manufacturing or service industries, or government agencies. Courses are designed to provide an environment whereby students may work with faculty members in their areas of expertise, structuring the courses in a way that enrichment in a particular specialty area can be achieved.

Students with an undergraduate degree in Industrial Engineering will have the opportunity of gaining additional expertise in the field. The engineer with a degree in another discipline can develop industrial engineering techniques, building upon his or her other particular background.

All students in the general program normally will take the core courses shown below. Equivalent substitutions must have Department approval.

Course	Credits
5.803 Industrial Organizations	2
5.823 Production Analysis (or equivalent)	4
5.824 Case Studies in Industrial Engineering (or equivalent)	2
5.909 Systems Engineering and Analysis	2
5.914 Advanced Operations Research	4
5.963 Statistics	2
5.905 Analysis with Simulation	2
5.992 Seminar (full-time students only)	2
5.991 Thesis	6
or	
5.993 Special Project	2 or 4
	22 to 26

The remaining hours are satisfied through a suitable choice of electives from the following categories:

- Management of Technology
- Operations Research and Quantitative Techniques
- Production Engineering and Man/Machine Systems
- Financial and Operational Controls
- Computer and Information Systems

Courses applicable to these areas of concentration are listed at the end of this section of the catalog. Arrangements for and approval of the topic and credit level for the special project or thesis must be made with a member of the full-time faculty of the department.

MASTER OF SCIENCE IN ENGINEERING MANAGEMENT**General Program**

The Engineering Management program is designed to provide an opportunity for engineers interested in careers in managing technical types of activities to strengthen their backgrounds. Emphasis is placed on quantitative tools for problem solving and decision making as well as financial and operational controls and basic management subjects. The core course requirements for the Engineering Management program are listed below:

Course	Credits
5.801 Analysis of Independent Enterprise I	2
5.803 Industrial Organizations	2
5.816 Industrial Psychology	2
5.830 Financial Management I	2
5.841 Engineering Project Administration	2
5.905 Analysis with Simulation	2
5.963 Statistics II	2
5.941 Management Information Systems	2
5.992 Seminar (full-time students only)	<u>2</u>
	16-18

The remaining twenty-four hours of course work may be used to satisfy the requirements of one of the four major areas of concentration or may be elected by the student to best meet his or her professional goals.

If no major concentration is selected, at least four quarter hours of elective must come from the Operations Research and Quantitative Techniques subject area, with the remaining twenty hours taken as adviser approved electives.

MAJOR AREAS OF CONCENTRATION

Students in Industrial Engineering or in the Engineering Management Master's degree program may elect to major in one of four areas of concentration. These areas are:

1. Assurance Sciences
2. Computer and Information Systems
3. Human Factors
4. Operations Research

If a student decides to major in one of these four areas, he or she must satisfy the core requirements in the degree program and, in addition, elect courses which satisfy the requirement within the major. The requirements of each major are described below.

Assurance Sciences Major

Assurance Sciences comprise engineering and management disciplines in reliability, maintainability, quality-control, integrated logistic support, and other related engineering/manufacturing product-support activities. The assurance sciences major is aimed at the practicing engineer/manager in assurance sciences who desires to enhance his or her skills, and the engineer/manager whose activities interact with those in the field of assurance sciences who desires to develop a working knowledge of those disciplines.

The following courses are required of all students electing the Assurance Sciences major:

Course	Credits
5.954 Advanced Quality Control	2
5.955 Mathematical Theory of Reliability	2
5.956 Reliability and Maintainability Assessment	2
5.957 Reliability Analysis of Complex Systems	2
5.964 Design of Experiment I	2
5.912 Network Planning and Control	2
Courses category (B)	4
(Operations Research and Quantitative Techniques) —	16

The courses selected from Category (B) must have adviser approval to insure that a cohesive program in either quality control engineering or reliability/maintainability engineering has been followed.

Computer and Information Systems Major

The Computer and Information Systems (C&IS) major is designed to meet the needs of students desiring a concentration in the design of management information systems to support decision processes and the hardware and software concepts necessary for the implementation of such systems. The emphasis placed on each area depends on the professional objectives of the student and the programs should be developed in consultation with the adviser.

The following courses are required of all C&IS majors:

Course	Credits
Courses from category (E)	14
(Computer and Information Systems) —	14

Human Factors Major

The Human Factors major gives the opportunity for specialized preparation for the design of equipment and work places with emphasis upon occupational

safety and health and upon provision of an effective man/machine interface. All Human Factors majors will be expected to fulfill the 12 quarter hours listed below as general requirements, and further to take at least six quarter hours from the Human Factors technical electives list.

Course	Credits
5.964 Design of Experiments I	2
5.965 Design of Experiments II	2
5.819 Human Factors in Man-Machine Systems	2
5.852 Human Factors—Work and Environment	2
5.854 Human Factors Engineering—Data Base	2
5.855 Human Factors Engineering—Application Methods	2
	<u>12</u>
Human Factors electives (see below)	6
	<u>18</u>

Human Factors

5.817 Advanced Work Design	2
5.814 Development of Engineering Managers	2
5.816 Industrial Psychology of Engineers	2
5.853 Man-Computer Interaction	2
5.862 Introduction to Occupational Health and Safety	2
5.863 Technical Aspects of Health and Safety	2
5.864 Topics in Physiology and Biomedical Engineering	2
5.991 Thesis	6

Operations Research Major

The major in Operations Research is intended to provide the opportunity for extensive course work in application of quantitative techniques to the solution of problems in manufacturing or service industries. The courses are designed to provide a rigorous mathematical basis plus a focus on application of the techniques. Program flexibility is intended to permit students reasonable freedom to pursue topics most appropriate to the individual career development.

All students electing the Operations Research major are required to take:

Course	Credits
Category (B) Operations Research	14
(must include 5.914)	
Category (E)	4
	<u>18</u>

Master of Science in Information Systems

This program is intended to serve graduate students from diverse academic backgrounds. The first set of courses (totaling 24 credits) will be required of students, or waived, depending on their particular academic background and undergraduate experience. This degree is designed to offer training to professionals who will bridge the gap between the manager and the computer specialist. Graduates of this program have the opportunity to be involved in the design, development, and implementation of management information systems and decision support systems. Such systems exploit computer technology to best serve the needs of decision makers.

The program consists of courses which develop both management and information systems skills. The former category includes courses such as Organizational Behavior, Accounting, and Management Science, while the latter covers topics such as Computer Technology, Data Base Management, Operating Systems, and Software Design.

This program permits graduates to focus their skills in the information systems area, while possibly serving as a vehicle for career transition. In addition, the Master of Science in Information Systems degree program offers students the opportunity to prepare themselves for positions including application programmers, information systems analysts, data base managers, and data center managers.

Applicants who are currently employed in the information system profession may pursue the degree on a part-time or full-time basis, but all other applicants are expected to enroll as full-time students for two quarters and then participate in the graduate cooperative education program by taking a position in information systems for a minimum of six months. During this time, candidates can continue to take courses in the evening graduate program to further meet the degree requirements.

Admission

The criteria for admission will include:

1. Receipt of a bachelor's degree or equivalent from an accredited university or college.
2. Transcript from all undergraduate and graduate programs in which applicant has previously enrolled.
3. Graduate Record Examination aptitude test score.
4. Two letters of recommendation.
5. Work experience in information systems (for part-time students).

Prerequisite Courses

It is expected that students beginning this program will have an adequate background in the following areas:

calculus
 probability
 accounting
 programming languages (including COBOL and an Assembly Language)

If students have not completed sufficient course work in any of these areas, they may enroll in the appropriate courses shown below.

Area	Course	Credits
Mathematics	10.8G1–G3 Elements of Mathematics for Information Systems I, II, and III	6
Probability	5.961, 962 Probability	4
Management Science	5.901, 902 Basic Operations Research I and II	4
Accounting	5.810, 811	4
Programming Languages	5.939 Principles of COBOL	2
	5.913 Data Processing for Engineers (FORTRAN)	2
	5.930 Basic Computer Science Technology (Assembly Language)	<u>2</u>
		24

Based upon the recommendation of the Graduate School and the adviser, a student may be required to take all or some of the above prerequisite courses. But no more than six hours of graduate credit can be earned from these prerequisite courses.

Degree Requirements

The degree requirements are 40 quarter hours of graduate credit including:

Course	Course Title	Credits
3.972	Electronic Digital Computers I	2
3.973	Electronic Digital Computers II	2
5.803	Industrial Organizations	2
5.920	Elements of Structured Programming	2
5.933	Data Structures for Information Systems	2
5.934	Data Base Management	2
5.938	File Processing	2
5.940	Basic Information System Technology	2
5.941	Management Information Systems	2

5.942	Management Information Systems: Planning and Control of MIS Development	2
5.943	Network and Telecommunication	2
5.945	Operating Systems and Systems Software I	2
5.946	Operating Systems and Systems Software II	2
5.947	Principles of Software Design	2
5.948	Information Systems and Society	2
		30
	Electives	4-10

THE INDUSTRIAL ENGINEER DEGREE

Description

This degree is designed for those who wish to undertake graduate study beyond the master's degree which is less extensive and more applied than that required for the doctorate. The program leading to the Industrial Engineer degree permits a candidate to pursue a course of study at the upper graduate level which will develop in-depth knowledge in selected Industrial Engineering techniques, and the ability to apply these techniques to complex problems in a real-world setting. The candidate will work closely with a faculty adviser throughout the program.

Credit Requirements

A minimum of 40 quarter hours beyond the master's degree is required. Normally ten quarter hours of credit out of the 40 will be granted for work on the Industrial Engineering degree project. A minimum of 20 quarter hours must be taken in Industrial Engineering.

Industrial Engineer Degree Project

In addition to the required course work, to be awarded the degree of Industrial Engineer, the candidate must complete a project demonstrating a high level of competence in structuring and solving a complex real-world problem. The problem to be addressed in this project is of an applied nature. Where applicable, an on-going organization will be used as the setting. The work should lead to a solution which satisfies all technological and organizational constraints, and is therefore capable of being implemented. The topic will be selected by the student and the faculty adviser. Normally, a project committee of three faculty members will be appointed.

Qualifications and Examinations

A student must maintain a 3.00 grade point average to qualify for the degree. A final oral examination for defense of the written report of the Industrial Engineer degree project conducted by the student's project committee is also a requirement for the degree.

Residence Requirement

Since the Industrial Engineer degree project requires the structuring and solving of a complex problem, residence requirements will be satisfied by that arrangement, approved by the adviser, which allows the student to devote a sufficient portion of his or her time to the project to permit an intensive problem-solving experience.

COURSE LISTINGS BY SUBJECT AREA**a. Management of Technology**

- 5.801&5.802 Analysis of the Industrial Enterprise I and II
- 5.803 Industrial Organizations
- 5.812 Managing Professional Personnel
- 5.813 Engineering Communication
- 5.814 Development of Engineering Managers
- 5.816 Industrial Psychology for Engineers
- 5.820 Personnel Administration for Engineers
- 5.823 Production Analysis (4 q.h.)
- 5.841 Engineering Project Management

b. Operations Research & Quantitative Techniques

- 5.903 Inventory Control and Production Planning
- 5.904 Queuing Theory and its Applications
- 5.905 Analysis with Simulation
- 5.906 Principles of Dynamic Systems I
- 5.907 Principles of Dynamic Systems II
- 5.909 Systems Engineering and Analysis
- 5.911 Linear Programming
- 5.912 Network Planning and Control
- 5.914 Advanced Operations Research (4 q.h. credit)
- 5.916 Engineering Analysis Utilizing Data Processing
- 5.918 Applied Topics in Operations Research
- 5.919 Independent Study in Operations Research
- 5.936 Simulation Methodology
- 5.953 Statistical Decision Theory
- 5.954 Advanced Quality Control
- 5.955 Reliability Theory in Design
- 5.956 Reliability and Maintainability Assessment
- 5.957 Reliability Analysis of Complex Systems
- 5.963 Statistics II
- 5.964 Design of Experiments I
- 5.965 Design of Experiments II

c. Production Engineering and Man/Machine Systems

- 5.806 Production Forecasting
- 5.817 Advanced Work Design

- 5.819 Human Factors—Sensory/Motor
- 5.822 Product Design and Value Analysis
- 5.823 Advanced Production Analysis (4 q.h.)
- 5.852 Human Factors—Work and Environment
- 5.853 Man Computer Interaction
- 5.854 Human Factors Engineering—Data Base
- 5.855 Human Factors Engineering—Application Methods
- 5.862 Introduction to Occupational Health, Safety
- 5.863 Technical Aspects of Health, Safety
- 5.903 Inventory Control and Production Planning
- 5.912 Network Planning and Control
- 5.954 Advanced Quality Control
- 5.956 Reliability and Maintainability Assessment

d. Financial and Operational Controls

- 5.805 Industrial Budgeting for Engineers
- 5.809 Advanced Engineering Economy
- 5.811 Cost Accounting for Engineers
- 5.830 & 5.831 Financial Management I and II
- 5.940 Basic Information Systems Technology
- 5.941 Management Information Systems

e. Computer and Information Systems

- 5.853 Man Computer Interaction
- 5.905 Analysis with Simulation
- 5.906, 5.907 Principles of Dynamic Systems I and II
- 5.916 Engineering Analysis Utilizing Data Processing
- 5.930 Basic Computer Systems Technology
- 5.931 Compiler Design I
- 5.932 Compiler Design II
- 5.933 Data Structures
- 5.934 Data Base Management
- 5.936 Simulation Methodology
- 5.940 Basic Information Systems Technology
- 5.941 Management Information Systems
- 5.942 Management Information Systems: MIS Planning, and Control Development
- 5.943 Distributed Data Processing
- 5.944 Computerized Financial Control Systems
- 3.983 Digital Computer Programming I
- 3.894 Digital Computer Programming II
- 3.895 Digital Computer III
- 3.9E1 Compiler Construction I-A *
- 3.9E2 Compiler Construction I-B *

* Both courses must be taken and successfully completed to receive credit.

- 3.972 Electronic Digital Computers I
- 3.973 Electronic Digital Computers II
- 3.974 Electronic Digital Computers III
- 3.985 Fundamentals of Language and Machine Theory I
- 3.986 Fundamentals of Language and Machine Theory II
- 3.987 Fundamentals of Language and Machine Theory III
- 3.988 Special Topics in Computer Science
- 3.989 Computer Peripherals

graduate program in transportation (interdisciplinary)

Admission

Individuals who have an interest in Transportation Planning and have an undergraduate degree with the appropriate mathematics background are permitted to enroll in the Interdisciplinary Transportation Program. Inquiries should be addressed to: Northeastern University Graduate School of Engineering, Interdisciplinary Transportation, 409 Churchill Hall, Boston, Massachusetts 02115.

MASTER OF SCIENCE IN TRANSPORTATION

Northeastern University has established a "Master of Science in Transportation" degree program to deal with the special needs of individuals who are preparing themselves for careers in transportation planning. The individual's program of study will aid the individual to acquire the necessary technical skills and social science background required of a transportation planner. Courses from the Colleges of Engineering, Arts and Sciences and Business Administration may be included in the student's program of study. In addition to the in-class training, a student will undertake an independent study project that results in a Master's Thesis or Master's Report. A student will work closely with an adviser on some current problem in transportation.

Full-Time Program

The program is arranged in a manner to allow a student to complete the program in one calendar year. Normally, a student will enroll in course work for three academic quarters beginning in September. The student will be eligible for graduation the following September if all course and thesis or report work is complete.

Part-Time Program

The part-time program is the same as the full-time program. The part-time student is allowed a maximum of seven years to complete all degree requirements.

Program of Study

Each student enrolled in the program is required to prepare a program of study which consists of required courses and electives in transportation and

related fields. If a student is lacking the necessary mathematics or economics background, the student must enroll in the prerequisite courses without receiving graduate credit. The program of study must consist of a minimum of forty quarter hours of credit and must be approved by the student's adviser.

Required Courses	Credits
1.807 Systems Analysis I	2
1.808 Systems Analysis II	2
1.835 Theory and Practice of Transportation Planning I	2
1.836 Theory and Practice of Transportation Planning II	2
1.916 Engineering Statistics I	2
1.917 Engineering Statistics II	2
22.847 The Politics of Transportation	3
39.9L5 Economics of Urban Transportation	3
48.801 Seminar in Intercity Transportation	3
93.820 Thesis	8
or	
93.819 Master's Report	4

Suggested Electives

1.207 Technology Assessment	4
1.809 Systems Analysis III	2
1.811 Urban Public Transportation	2
1.813 Traffic Flow Theory I	2
1.814 Traffic Flow Theory II	2
1.815 Urban Transportation Analysis I	2
1.816 Urban Transportation Analysis II	2
1.817 Traffic Engineering	2
1.820 Transportation Engineering	2
1.865 Environmental Impacts of Transportation I	2
1.866 Environmental Impacts of Transportation II	2
5.904 Queuing Theory	2
5.905 Analysis with Simulation	2
5.913 Data Processing (Fortran)	2
5.914 Advanced Operations Research	4
5.916 Engineering Analysis Utilizing Data Processing	2
5.941 Management Information Systems	2
22.845 Problems of Urban Administration	3
22.846 Problems of Regional Development	3
39.9K1 Regional Economics	3
39.9L1 Urban Economics I	3
22.841 Problems of Urban Planning	3
22.842 Techniques of Urban Planning	3
22.843 The Politics of Urban Planning	3
22.861 Grantsmanship	3

48.805	Urban Transportation	3
39.9L2	Urban Economics II	3
39.277	Economics of the Quality of Urban Environment and Control	4
39.9L7	Economics of Intercity Transportation	3
39.9R1	Seminar in Development Planning	3
93.818	Special Topics of Transportation	3

Prerequisites (Graduate credit approval of Program Adviser.)

**BIO-ENGINEERING
(INTERDISCIPLINARY)**

See page 159 for course selections and descriptions.



description of courses

CIVIL ENGINEERING

The following undergraduate courses, which are given in the daytime, may be elected by graduate students for graduate credit subject to the credit hour restrictions described below. Approval must be made on a graduate engineering petition form and submitted to the Graduate Engineering office. A maximum of eight quarter hours of credit at this level may be applied toward a Master's degree. Those civil engineering courses listed below and courses from other departments that are of an advanced undergraduate or prerequisite level are indicated by an asterisk () and apply to the eight quarter hour maximum regulation.*

***1.207 Technology Assessment (4 q.h. credits)**

The fundamental concepts of technology assessment will be covered, including the market system, externalities, decision analysis, risk acceptance, the problems of scale, and technological monocultures. The unintended impacts of the higher-order effects of technologies will be stressed throughout the course. *Prep. Permission of instructor.*

***1.210 Legal Aspects of Civil Engineering (4 q.h. credits)**

Embodies the material in 1.832 and 1.833. Description and evaluation of the various types of contracts for engineering services and construction, procedures and formats for submitting bids, procedures for filing claims, legal steps to avoid liabilities.

***1.234 Theory and Practice of Transportation Planning (4 q.h. credits)**

Embodies the material in 1.835 and 1.836. This course includes the establishment of goals, objectives, and criteria, current planning framework, demand modeling from regional economy to transportation network assignments, mode selection, technical and economic evaluation, current issues including environmental assessment, transportation systems management, and citizen participation and planning in developing countries.

***1.259 Air Pollution (4 q.h. credits)**

Theory and practice related to engineering management of air resources, microclimate and dispersion of pollutants, atmospheric chemistry, air pollution instrumentation, control of gaseous and particulate emissions, and design of air pollution control systems. Biological and chemical aspects of air pollution with emphasis on the toxicological aspects of the environment, physiological effects of aerosols, analysis of organic and inorganic constituents of the atmosphere, and rationale for establishment of air quality criteria and standards. *Prep. Admission to Graduate School of Engineering.*

The following graduate courses carry two quarter hours of credit unless otherwise noted. Courses carrying four quarter hours of credit are day courses. Not all courses are offered every year. Refer to the Graduate School of Engineering circular issued about July 1 each year for the courses to be offered in the new academic year and the times at which they are scheduled to meet.

1.807 Systems Analysis I

Application of linear optimization models to various civil engineering problems: the simplex method, sensitivity analysis, transportation problem, transshipment problem, shortest path problem. *Prep. Admission to the Graduate School of Engineering.*

1.808 Systems Analysis II

Further application of systems analysis techniques to civil engineering problems: dynamic programming, linear regression, model estimation, queuing theory, project evaluation. *Prep. 1.807, Systems Analysis I, and 1.916, Engineering Statistics I. To be taken concurrently with 1.917, Engineering Statistics II.*

1.809 Systems Analysis III

Further application of techniques and approaches presented in 1.807 and 1.808. New topics to be presented include integer programming, nonlinear programming, simulation, decision analysis, other topics may be added according to interest, as time allows. Aim will be to help prepare students to complete a term project employing numerous techniques of systems analysis. *Prep. 1.808, Systems Analysis II.*

1.811 Urban Public Transportation

Analysis and planning of public transportation systems, including bus, subway, commuter rail, and paratransit; performance prediction; service evaluation and efficiency control measure; demand prediction; institutional and economic issues.

1.813 Traffic Flow Theory I

Statistical methods in traffic flow theory, probability models, hypothesis testing and its use, queuing theory, and simulation techniques. *Prep. Appropriate courses in calculus and statistics and permission of instructor.*

1.814 Traffic Flow Theory II

Continuation of 1.813. Deterministic methods in traffic flow theory, car following models, various methods of determination of capacity and level of service, computer applications. *Prep. 1.813, Traffic Flow Theory I.*

1.815 Urban Transportation Analysis I

Principles of analysis of urban transportation systems including travel demand equilibrium, performance and evaluation techniques using aggregate and disaggregate methods. *Prep. 1.836, Theory and Practice of Transportation Planning II, and appropriate statistics courses such as 1.916 and 1.917 or 5.961 and 5.962.*

1.816 Urban Transportation Analysis II

Continuation of 1.815. Conceptualization, formulation, application, and evaluation of mathematical models utilized in urban transportation systems analysis; case studies of representative analyses. The objective of this course is to help prepare students to conceptualize, formulate, apply, and evaluate appropriate mathematical modeling techniques in transportation. *Prep. 1.815, Urban Transportation Analysis I.*

1.817 Traffic Engineering

Measurement of traffic characteristics and system performance; theory of traffic flow and analytical techniques; systems hardware design and evaluation; current concerns in

energy, environmental, and urban amenity impacts; computer applications and institutional characteristics.

1.820 Transportation Engineering

Description and evaluation of different modes of transportation existing and proposed; their performance and cost characteristics; design, performance, and selection criteria for vehicles and roadbeds. *Prep. Admission to Graduate School of Engineering.*

1.821 Cost of Construction Projects

This course treats cost estimating, including a description of computerized cost estimating systems; duration estimating, considering work analysis techniques; value engineering as a concept and its effect on the construction industry; and specifications, including the use and importance of computerized Specification Writing Systems.

1.822 Planning and Control of Construction Activities

This course contains treatment of the application of scheduling methods to the control of construction activities including resource allocation, quality control, cash flow progress reporting, and the effects of change orders.

1.824 Engineering Materials I—Cements and Concretes

Topics covered include the chemistry, hydration, microstructure, strength, admixtures, and volume changes (shrinkage, swelling, creep) of cements and concretes. Introduction to special concretes such as underwater concrete, high-density concrete used for radiation shielding, and expansive cement concretes. *Prep. Admission to Graduate School of Engineering.*

1.825 Engineering Materials II—Strength and Microstructure of Solids

Topics covered are the elastic, inelastic, and plastic properties of solids; relation between the internal structure of solids and the corresponding mechanical properties. Application of the concepts developed. *Prep. Admission to Graduate School of Engineering.*

1.827 Construction Seminar

This course is a reading and discussion course, centering on recent research publications in Construction Engineering. *Prep. Permission of the Civil Engineering Department.*

1.830 Construction Methods and Equipment I

This course treats typical approaches to construction in a selection of application areas such as steel and concrete structures, hydraulic and port facilities, horizontal construction, and the like.

1.831 Construction Methods and Equipment II

This course is a continuation of 1.830, treating additional areas of construction.

1.832 Legal Aspects of Civil Engineering I

This course deals with the description and evaluation of various types of contracts for engineering services, bidding procedures, format and procedures for construction contract bid tender packages.

1.833 Legal Aspects of Civil Engineering II

This course deals with the description and evaluation of various types of construction contracts, procedures and formats for submitting bids, filing claims, and legal steps to avoid liabilities.

1.835 Theory and Practice of Transportation Planning I

Establishments of goals, objectives and criteria; the current planning framework; examination of performance characteristics of transportation systems, including public and private modes on land, water, and airways.

1.836 Theory and Practice of Transportation Planning II

Continuation of 1.835. Transportation demand modeling from regional economic analysis to traffic and public transportation network assignment; technical and economic evaluation; current issues, including environmental assessment, transportation systems management, citizen participation, and planning in developing countries. *Prep. 1.835, Theory and Practice of Transportation Planning I.*

1.841 Advanced Structural Mechanics I

Analysis of force equilibrium (stress), deformation/displacement (strain), and force/deformation (Hooke's law) for an elastic solid; compatibility; governing equations for complete and approximate elasticity solution. Plane stress solution for narrow rectangular beams. Torsion, Saint Venant's theory, membrane analogy, rectangular sections, thin open and closed sections. Introduction to bending of thin plates. *Prep. Undergraduate structural mechanics and structural analysis.*

1.842 Advanced Structural Mechanics II

Consistent models for the mechanics of simple structural elements: axial, bending, plane stress, and the like. Equilibrium, geometry of deformation, and force/deformation as the governing relations of all structural elements. Work and energy principles: virtual displacement, virtual forces, minimum potential energy, minimum complementary energy, introduction to variational ideas, Rayleigh-Ritz Method. *Prep. 1.841, Advanced Structural Mechanics I.*

1.843 Finite-Element Analysis of Structures I

Introduction to finite-element method for structural analysis. Overview of direct stiffness method. Formulation of element stiffness matrices by direct use of elasticity relations and by energy methods for simple elements: axial, bending, plane stress, and plane strain; transformation of coordinate systems; lumping and work equivalent loads; bounds on the error of solution. Plate bending. Use of finite-element computer programs. *Prep. 1.842, Advanced Structural Mechanics II.*

1.844 Finite-Element Analysis of Structures II

Additional applications of the finite-element method. *Prep. 1.843, Finite-Element Analysis of Structures I.*

1.847 Advanced Structural Mechanics (4 q.h. credits)

This course, offered days, embodies the material in 1.841 and 1.842, Advanced Structural Mechanics I and II. *Prep. Undergraduate structural mechanics and structural analysis.*

1.849 Model Analysis

Development of the principles of similitude to establish the relationship between behavior in the model and the full-sized structure. Review of techniques to fabricate, to load, and to instrument models. Application and use of strain gauges. The laboratory portion is devoted to model analysis of a complex structure. *Prep. Admission to program and approval of instructor.*

1.850 Seismic Design

Earthquake considerations in building design process, dynamic analysis of multi-degree-of-freedom elastic systems subjected to earthquake motions and cyclically applied forces, inelastic dynamic response analysis. Seismic provisions of building codes; soil-structure interaction. *Prep. 1.886, Soil Dynamics I.*

1.851 Selected Topics in Earthquake Engineering

Seismic hazard and seismic risk analysis; seismic design decision analysis; lifeline earthquake engineering; pipelines, liquid storage tanks, water distribution systems; earthquake analysis of earthdams and slopes; dynamic analysis of retaining walls and offshore facilities; dynamically loaded piles. *Prep. 1.886, Soil Dynamics I.*

1.853 Concrete Structures I

Fundamentals of prestressing; design of prestressed concrete beams for flexure and shear; design of end blocks; load balancing method for the analysis of indeterminate prestressed structures; column design. *Prep. Undergraduate Reinforced Concrete Design and Structural Analysis.*

1.854 Concrete Structures II

Design of two-way slabs by the equivalent frame method; shearhead design; yield line theory; prestressing of slabs; the strip method; and introduction to folded plate design. *Prep. Undergraduate Reinforced Concrete Design and Structural Analysis.*

1.855 Concrete Structures III

Additional topics of folded plate design, design of thin shelled structures including hyperbolic paraboloids and shells of revolution. *Prep. 1.854 Concrete Structures II.*

1.856 Finite-Element Analysis of Structures (4 q.h. credits)

This course, offered days, embodies the course content offered in 1.843 and 1.844, Finite-Element Analysis of Structures I and II.

1.858 Concrete Structures (4 q.h. credits)

This course, offered days, embodies the material in 1.853 and 1.854, Concrete Structures I and II. *Prep. Undergraduate Reinforced Concrete Design and Structural Analysis.*

1.859 Stability

Prediction of the buckling loads of columns, behavior of beam-columns, use of numerical methods to compute the buckling loads of nonprismatic members, buckling of plates.

Prep. 1.841 and 1.842.

1.861 Design of Structures I

An advanced course in elastic design in structural steel. Design problems involving braced and rigid frame structures subject to gravity, wind, and seismic loads are considered.

Prep. Undergraduate Steel Design and Structural Analysis.

1.862 Design of Structures II

An advanced course in analysis and design in structural steel with emphasis on plastic behavior including rigid frame buildings and braced multistory frame buildings. *Prep. Undergraduate Steel Design and Structural Analysis.*

1.863 Design of Structures III

Advanced problems in elastic and plastic design of structural steel. Topics include curved girders, cable supported structures, fatigue considerations, and composite sections with steel deck. *Prep. Undergraduate Steel Design and Structural Analysis.*

1.864 Design of Structures (4 q.h. credits)

This course, offered days, embodies the material in 1.862 and 1.863—Design of Structures II and III. *Prep. Undergraduate Steel Design and Structural Analysis.*

1.865 Environmental Impacts of Transportation I

Examination of the human response to noise, water, and air pollution; physical effects of the pollution in relation to source-receptor configurations and urban scale meteorology; laboratory and field techniques in measuring pollution levels for air, noise, and water, and application of results to environmental impact assessment. *Prep. Admission to Graduate School of Engineering.*

1.866 Environmental Impacts of Transportation II

Continuation of 1.865. Government policy, regulations and guidelines concerning the environment and their effects on transportation planning, and preparation of appropriate documentation. *Prep. 1.865, Environmental Impacts of Transportation I.*

1.871 Soil Mechanics I

Phase relationships and index properties, permeability, capillarity, effective stress concept, porous media flow, stress distribution, stress path concept, 1-D settlement analysis. *Prep. Undergraduate course in soil mechanics.*

1.872 Soil Mechanics II

A continuation of 1.871. Consolidation theory, 3-D settlement analysis, shear strength properties of soils, stress path analysis. *Prep. 1.871, Soil Mechanics I.*

1.873 Soil Mechanics III

A continuation of 1.872. Stability of open cuts and natural slopes; numerical analysis and computer applications to stability, seepage, consolidation, and deformation problems; laboratory testing; field instrumentation; special topics. *Prep. 1.872, Soil Mechanics II.*

1.874 Foundation Engineering I

Lateral earth pressure theory; retaining wall design; anchored bulkheads; braced cofferdams, dewatering, observational approach to design. *Prep. 1.872 Soil Mechanics II.*

1.875 Foundation Engineering II

Bearing capacity, design of shallow foundations, site improvement (preloading, deep densification), case studies of foundation performance. *Prep. 1.874, Foundation Engineering I.*

1.876 Foundation Engineering III

Pile foundations, caissons, selection of foundation scheme; case studies. *Prep. 1.875, Foundation Engineering II.*

1.877 Soil Mechanics (4 q.h. credits)

This course, offered days, embodies the material in 1.871 and 1.872, Soil Mechanics I and II. *Prep. Undergraduate course in basic soil mechanics.*

1.878 Foundation Engineering (4 q.h. credits)

This course, offered days, embodies the course content offered in 1.874 and 1.875, Foundation Engineering I and II. *Prep. 1.872 Soil Mechanics II.*

1.882 Engineering Geology

Review of minerals, selected topics in historical and structural geology related to engineering geology; origin and occurrence of various rock types, geologic structures, faulting and joint systems; weathering of rock and weathering products, glaciation, geologic mapping and environmental aspects. *Prep. Undergraduate course in geology.*

1.884 Rock Mechanics I

Interrelationship with other disciplines; index properties; classification systems; laboratory tests; state of stress and stress distribution. *Prep. 1.882, Engineering Geology.*

1.885 Rock Mechanics II

Behavior of rock under combined stresses; pore pressure effects; failure theories; insite deformation modulus and shear strength characteristics; field testing. *Prep. 1.884, Rock Mechanics I.*

1.886 Soil Dynamics I

Dynamic response analysis of one-degree-of-freedom systems, characteristics of earthquakes and resulting ground motions, response spectra, stress-strain behavior of soils during dynamic and repeated loading, laboratory and field determinations, wave propagation through elastic media, effect of local soil condition upon earthquake ground motions. *Prep. Admission to the program*

1.887 Soil Dynamics II

Dynamic response analysis of a single mass, multi-degree-of-freedom systems; machine foundation design and analysis; soil-structure interaction, ground vibrations, sources, and control; shear strength during repeated loading, liquefaction; dynamic analysis of retaining structures and slopes. *Prep. 1.886 Soil Dynamics I.*

1.888 Numerical Methods in Civil Engineering I

Formulation and solution of equations for lumped parameter and continuous systems for both equilibrium and propagation problems. Solution of simultaneous equations, differential, partial differential, and integral equations are covered. Emphasis is given to finite difference solutions. Examples are drawn from structural mechanics, geotechnical engineering, hydrology and hydraulics. *Prep. Admission to Graduate School of Engineering.*

1.889 Numerical Methods in Civil Engineering II

Continuation of 1.888. Introduction of eigenvalue problems. The computer solution of large systems of equations. Introduction to Fourier series solution and the fast Fourier transform. *Prep. 1.888, Numerical Methods in Civil Engineering I.*

1.890 Numerical Methods in Civil Engineering (4 q.h. credits)

This course, offered days, combines the material of 1.888 and 1.889, Numerical Methods in Civil Engineering I and II, with emphasis on structural and geotechnical problems. *Prep. Admission to the Graduate School of Engineering.*

1.902 Open Channel Flow I

One-dimensional equation of motion, interaction of controls and surface profiles: the discharge problem, computation of surface profiles in natural and artificial channels, spatially varied flow, channel transitions. *Prep. Undergraduate fluid mechanics and hydraulic engineering.*

1.903 Open Channel Flow II

Further considerations in unsteady flow; St. Venant equations; dynamic, diffusive, and kinematic waves; flood routing in reservoirs and rivers; overhaul flow. *Prep. 1.902 and 1.888.*

1.904 Open Channel Flow (4 q.h. credits)

This course, offered days, embodies substantially the material in 1.902 and 1.903, Open Channel Flow I and II. *Prep. Undergraduate fluid mechanics, hydraulic engineering, and 1.888.*

1.908 Hydrology I

The watershed, the water balance equation and its components, unit hydrograph theory, cascade of linear reservoirs, flood routing, single deterministic rainfall-runoff models. *Prep. 1.916 and 1.917.*

1.909 Hydrology II

Markov processes and time series, stochastic generation of streamflow data, reservoir sizing, stochastic analysis of precipitation, combined stochastic deterministic simulation, flood hydrology, and design considerations. *Prep. 1.908.*

1.910 Water and Wastewater Treatment I

Water quality, water impurities and effects, the theory and practice of water treatment, and the elements of design of water treatment works including intake facilities, wells, filtration, coagulation, sedimentation, softening, iron and manganese removal, disinfection, and fluoridation. *Prep. 1.921, Environmental Chemistry II and undergraduate fluids/hydraulics.*

1.911 Water and Wastewater Treatment II

Waste characteristics, the theory and practice of wastewater treatment and disposal, and the elements of design of primary and secondary treatment works, including screening, grit removal, sedimentation, biological treatment processes, sludge digestion and disposal, stabilization ponds, and disinfection. *Prep. 1.910, Water and Wastewater Treatment I.*

1.912 Water and Wastewater Treatment III

Salt water conversion, advanced wastewater treatment, and other special problems in water and wastewater characteristics and treatment, including corrosion control, application of chemicals, radioactive wastes, thermal pollution, and treatment plant instrumentation. *Prep. 1.911, Water and Wastewater Treatment II.*

1.913 Industrial Waste Disposal

Evaluation of industrial waste problems and development of process design for the required treatment facilities; study of various manufacturing processes and their wastewater problems; industrial waste survey techniques; characteristics of industrial wastes; waste reduction methods; physical, chemical, biological, and advanced treatment methods; industrial wastewaters and disposal and treatment of industrial solids and liquids.

Prep. 1.912, *Water and Wastewater Treatment III* and 1.921, *Environmental Chemistry II*.

1.914 Water & Wastewater Treatment (4 q.h. credits)

This course, offered days, embodies the material in 1.910 and 1.911—Water and Wastewater Treatment I and II. *Prep.* Two undergraduate semesters of hydraulics.

1.916 Engineering Statistics I

The basic elements of probability theory and statistics and their use via the solution of various civil engineering problems encountered in fluid mechanics, construction management, structures, transportation. Probability of events, random variables and distributions, derived distributions, expectation, common probability models.

Prep. Undergraduate calculus.

1.917 Engineering Statistics II

Continuation of 1.916. Includes parameter estimation, confidence intervals, hypothesis testing, and linear statistical models. *Prep.* 1.916, *Engineering Statistics I*.

1.920 Environmental Chemistry I

A review of basic chemistry is followed by a discussion of the equilibrium chemistry of homogeneous and heterogeneous systems with applications in environmental engineering. The physical and chemical properties of water are studied as are acidity, alkalinity, hardness, and water softening. Topics in receiving water quality and disinfection are included. *Prep.* Two quarters of general chemistry.

1.921 Environmental Chemistry II

Continuation of 1.920. Includes the basic principles of chemical thermodynamics, electrochemistry, kinetics, organic chemistry, biochemistry, and nuclear chemistry as they relate to wastewater treatment. Colloidal chemistry and coagulation are discussed as are the fundamental water quality parameters such as BOC, COD and TOC. *Prep.* 1.920, *Environmental Chemistry I*.

NOTE: It is strongly recommended that 1.921 be taken concurrently with 1.930, Environmental Analysis I.

1.922 Environmental Bacteriology

A study of bacteriology with emphasis on environmental engineering applications. The course includes cell structure, nutrition, morphology, growth, reproduction, and metabolism of bacteria. Effects of environmental factors including inhibition, killing, and natural habitats are discussed. Methods of quantitative bacteriology are also covered. *Prep.* 1.921, *Environmental Chemistry II*.

NOTE: It is strongly recommended that 1.922 be taken concurrently with 1.931, Environmental Analysis II.

1.923 Environmental Chemistry (4 q.h. credits)

This course, offered days, embodies the material in 1.920 and 1.921—Environmental Chemistry I and II. *Prep. Two semesters of general chemistry.*

1.924 Flow Through Porous Media

Definitions, Darcy's Law, potential flow analogy and flow nets, Dupuit's approximation, study flow applications, seepage through earth dams, well hydraulics and groundwater flow. *Prep. Fluid mechanics.*

1.925 Groundwater and Seepage

Steady and transient flow in confined and unconfined aquifers, approximate (Dupuit and Boussinesq) and complete (Laplace) problem formulation, salt water intrusion. *Prep. 1.924, Flow Through Porous Media, and 1.888, Numerical Methods.*

1.930 Environmental Analysis I

A laboratory course for the analytical evaluation of environmental conditions. Included are coagulation studies, chlorine demand determination, and the use of colorimetric spectroscopy. Interpretation of analytical results for practical applications is also stressed.

NOTE: It is strongly recommended that 1.930 be taken concurrently with 1.921, Environmental Chemistry II.

1.931 Environmental Analysis II

Laboratory analyses are continued with emphasis on the chemical and biological analyses associated with wastewater treatment methods. Nitrogen determinations are included. Gas chromatography and atomic absorption spectroscopy are used for trace analyses of organics and metals. *Prep. 1.930, Environmental Analysis I.*

NOTE: It is strongly recommended that 1.931 be taken concurrently with 1.922, Environmental Bacteriology.

1.933 Environmental Analysis (4 q.h. credits)

This course, offered days, embodies the material in 1.930 and 1.931, Environmental Analysis I and II. *Prep. 1.923, Environmental Chemistry taken concurrently.*

1.935 Unit Operations in Environmental Engineering I

Laboratory scale unit operations illustrating the physical, chemical and biological principles involved in water and wastewater treatment. The aim is to obtain criteria for system design. Topics include disinfection, water softening, sedimentation, chemical coagulation, and ion exchange. *Prep. 1.931, Environmental Analysis II.*

1.936 Unit Operations in Environmental Engineering II

A continuation of 1.935. Topics include biodegradability studies using activated sludge, anaerobic digestion, vacuum filtration, and chemical-physical process involved in wastewater treatment. A comprehensive evaluation of each unit process is required in a report from each student. *Prep. 1.935, Unit Operations in Environmental Engineering I.*

1.938 Unit Operations in Environmental Engineering (4 q.h. credits)

This course, offered days, embodies the material in 1.935 and 1.936, Unit Operations in Environmental Engineering I and II. *Prep. 1.933, Environmental Analysis and 1.913, Industrial Waste Disposal.*

1.940 Public Health Engineering Survey

An historical survey of public health conditions to introduce the student to the modern approach to public health engineering problems. Applications of engineering principles to such problems as garbage and refuse disposal, control of insect-borne diseases, milk and food sanitation, rodent control, camp and recreational sanitation, housing, control of atmospheric pollution, and radiological health. *Prep. Admission to Graduate School of Engineering.*

1.945 Solid Waste Management

Basic solid waste management for engineering and science students covering storage, collection practices, sanitary landfill principles, incineration practices and reclamation possibilities. *Prep. Admission to Graduate School of Engineering.*

1.950 Air Pollution Engineering

Theory and practice related to engineering management of air resources; applications of models for the atmospheric dispersion of pollutants; analysis of control systems for gaseous and particulate emissions utilizing dry collection, wet collection, absorption, and catalytic processes. Discussion of source control evaluation and air quality standards. Course 1.957 is recommended. *Prep. Admission to Graduate School of Engineering.*

1.951 Radiological Health Engineering

Types and sources of radioactive wastes, methods of handling, storage, and disposition of solid, liquid, and gaseous radioactive wastes. Regulatory agency requirements. *Prep. Admission to Graduate School of Engineering.*

1.952 Industrial Hygiene

Characterization and control of industrial problems associated with noise, heat and ventilation. Physical and biological aspects of environmental stress are discussed. Emphasis is placed on the application of engineering principles to the design of control systems. Evaluation procedures for control effectiveness are reviewed. *Prep. Admission to Graduate School of Engineering.*

1.953 Environmental Microbiology

An advanced course in environmental microbiology. Anaerobic decomposition and eutrophication; transformations of environmental products containing compounds of sulfur, nitrogen, complex hydrocarbons and pesticides. Advanced techniques for the simulation and evaluation of microbiological systems applied to biological control of water and wastewater. *Prep. 1.922, Environmental Bacteriology.*

1.954 Stream Sanitation

Analysis of the disposal of conservative and non-conservative pollutants in streams. Topics include water quality standards, BOD and oxygen relationships in streams, bacterial pollution, eutrophication, thermal pollution, and general corrective control methods in streams. *Prep. 1.920, Environmental Chemistry I.*

1.955 Air Sampling and Analysis

A laboratory course on air pollution measurements utilizing physical, chemical, and instrumental methods and calibration and use of sampling equipment for gaseous and particulate pollutants. Identification and quantitative measurements of pollutants are per-

formed utilizing microscopy, spectrophotometry, gas chromatography, and atomic absorption spectroscopy. *Prep. 1.950, Air Pollution Engineering.*

1.956 Air Pollution Control (4 q.h. credits)

This course, offered days, embodies the material of 1.950, Air Pollution Engineering and 1.955, Air Sampling and Analysis. *Prep. Admission to Graduate School of Engineering.*

1.957 Air Pollution Science

Biological and chemical aspects of air pollution with emphasis on the toxicological aspects of the environment, physiological effects of aerosols, analysis of organic and inorganic constituents of the atmosphere and rationale for establishment of air quality criteria and standards. Note: Course 1.957 is open to non-engineering graduate students as well as engineering graduate students. *Prep. Consent of the department and instructor.*

1.963 Hydraulic Structures I

Flood studies, concrete gravity dams, earthfill dams, spillways, outlet works, hydroelectric machinery. *Prep. Undergraduate hydraulics.*

1.964 Hydraulic Structures II

Intake structures, tunnels and pipelines, canals and canal structures, shoreline protection, coffer dams. *Prep. 1.963, Hydraulic Structures I.*

1.965 Water Resources Planning

Descriptive and prescriptive models, water resources systems applications, optimization methods, simulation modelling, elements of economy, multiobjective modelling, critical path methods, river basin planning and management. *Prep. 1.909, Hydrology II.*

1.970 Design of Environmental Systems (4 q.h. credits)

The development of comprehensive engineering reports. Fundamental design concepts of complete systems for environmental control, including water treatment; wastewater disposal, air quality control, and solid waste disposal; evaluation of economic alternatives for environmental quality control; discussion of actual engineering reports and designs will include considerations of the logic and conclusions. *Prep. 1.912, Water and Wastewater Treatment III.*

1.971 Design of Environmental Systems I

The development of comprehensive engineering reports. Fundamental design concepts of complete systems, covering half the topics outlined in course 01.970. Includes evaluation of economic alternatives for environmental quality control; discussion of actual reports and designs. *Prep. 1.912 Water and Wastewater Treatment III.*

1.972 Design of Environmental Systems II

Continuation of design concepts and evaluation as offered in 1.971. Remaining topics outlined in 1.970 will be covered. *Prep. 1.971 Design of Environmental Systems I.*

1.980 Environmental Planning and Management

Planning, operation, and management of specific environmental systems, such as collection and treatment systems: solids separators, combined systems control, sewer flushing, deposition loadings with least squared applications, and case studies in optimal/

design of treatment plants with variable input. *Prep. Admission to Graduate School of Engineering.*

1.985 Environmental Protection

Environmental quality and its effects on health, comfort, aesthetics, balance of ecosystems and renewable resources; interaction of the water-land-air complex, vector control, food protection, ionizing radiation, other radiation, and the energies of heat and sound. *Prep. Admission to the Graduate School of Engineering.*

1.991 Thesis (Master's Degree) (8 q.h. credits)

Analytical and/or experimental work conducted by arrangement with and under the supervision of the department. *Prep. Permission of the Civil Engineering Department.*

1.992 Special Topics in Civil Engineering

Topics of interest to the staff member conducting this course are presented for advanced study. The course is initiated by the appropriate discipline committee and approved by the Department.

1.993 Master's Report (4 q.h. credits)

An individual effort consisting of laboratory and/or literature investigation and analysis or advanced design of a project in an area of civil engineering selected by student and adviser resulting in a definitive report. *Prep. Permission of the Civil Engineering Department.*

1.994 Seminar—Environmental Engineering

Discussions by professional engineers and scientists, faculty, and graduate students on subjects in the area of environmental engineering and science. Open to day students only. *Prep. Consent of the instructor.*

1.995 Special Projects in Civil Engineering

An individual effort in an area selected by student and adviser resulting in a definitive report. *Prep. Permission of the Department.*

1.996 Seminar—Environmental Health

Discussion by professional people in the public health field, faculty, and graduate students on subjects within the area of environmental health. Open to day students only. *Prep. Consent of the instructor.*

1.997 Thesis (Ph.D. Degree)

Open to day students only. *Prep. Admission to doctoral program in Environmental Engineering.*

MECHANICAL ENGINEERING

Prerequisite courses and advanced undergraduate courses will not be given credit unless approved by an academic adviser. Approval must be made on a graduate engineering petition form and submitted to the Graduate Engineering office. A maximum of eight quarter hours of credit at this level may be applied toward a Master's degree. The courses listed below are the Mechanical Engineering courses of an advanced undergraduate, first-year graduate level. The mechanical

engineering courses listed below and courses from other departments that are of an advanced undergraduate or prerequisite level are indicated by an asterisk (*) and apply to the eight quarter hour maximum regulation.

Course	Credits
*2.232 Engineering Materials	4
*2.233 Thermodynamics of Propulsion	4
*2.236 Nuclear Engineering I	4
*2.237 Nuclear Engineering II	4
*2.240 Combustion Engines	4
*2.258 Gas Dynamics	4
*2.260 Heat and Mass Transfer	4

The following undergraduate courses which are given in the daytime, may be elected by graduate students for graduate credit subject to the credit hour restrictions listed above.

2.232 Engineering Materials (4 q.h. credits)

Covers thermodynamics of materials; phase equilibria ternary systems; reactions with environment, i.e. kinetics, oxidation, corrosion, etc.; materials design criteria and materials engineering case studies. *Prep. Admission to the Graduate School of Engineering.*

2.233 Thermodynamics of Propulsion (4 q.h. credits)

Application of the physical principles of thermodynamics and fluid mechanics to the prediction of the behavior of propulsion devices; airbreathing engines and rocket engines with applications to show how physical laws describe and limit performance of particular devices. *Prep. Admission to the Graduate School of Engineering.*

2.236 Nuclear Engineering I (4 q.h. credits)

Study of Nuclear Physics emphasizing atomic and nuclear structure, radioactive decay, and nuclear reactions with particular attention to fusion and fission; health physics, nuclear instrumentation, and the production and uses of radio-active isotopes; comparison of thermal, fast, and breeder reactor types; discussion of neutron interactions and slowing down; four-factor formula and the diffusion equation developed and applied to one-group theory for bare and reflected thermal reactors; energy production and distribution within the core; flux shaping. Not open to students who have completed 2.942, 2.943, and 2.944. *Prep. Admission to the Graduate School of Engineering.*

2.237 Nuclear Engineering II (4 q.h. credits)

Development of two-group theory for thermal reactors; the physics and safety of fast reactors; effect of reactivity change, either intentional or accidental; changes due to temperature; fission product buildup, xenon buildup after shutdown, and fuel depletion; reactor design considerations including the interrelationship of reactor physics, reactor engineering (physical design heat transfer, etc.), reactor materials and economics; control and distribution of power; fuel cycle management. Not offered to students who have completed 2.942, 2.943, and 2.944. *Prep. Admission to the Graduate School of Engineering.*

2.258 Gas Dynamics (4 q.h. credits)

This course continues the study of fluid mechanics with emphasis on compressibility phenomena. The concept of sound speed is introduced and attention is devoted to one-

dimensional steady flows. The effects of area change, friction, and heat transfer are considered, including the study of normal shock waves and the behavior of nozzles and diffusers. *Prep. Admission to the Graduate School of Engineering.*

2.260 Heat and Mass Transfer (4 q.h. credits)

Heat exchanger design will be presented by both the logarithmic mean temperature difference (LMTD) and the effectiveness-NTU (number of transfer units) methods. This will be followed by a discussion of radiant heat transfer, the nature of solar radiation, and the design of flat plate solar collectors. *Prep. 2.150 Heat Transfer.*

The following are graduate courses which carry two quarter hours of credit unless otherwise noted. Courses carrying four quarter hours of credit are day courses. Seminar and thesis may have varying credits established by the department at the time of registration. Not all courses are offered every year. Refer to the Graduate School of Engineering circular issued about July 1 each year for the courses to be offered in the new academic year and the times at which they are scheduled to meet.

2.804 Theory of Elasticity I

Analysis of Cartesian tensors using indicial notation. Stress and strain concepts; point stress and strain; relation to tensor concepts. Governing equations for the determination of stress and displacement distributions in an elastic solid. *Prep. Admission to the Graduate School of Engineering.*

2.805 Theory of Elasticity II

Exact solutions to the governing equations; plane stress and strain problems in rectangular and polar coordinates including thermal stress; torsion of prismatic and axially symmetric bars; bending of thin flat rectangular and circular plates. *Prep. 2.801, Continuum Mechanics or 2.804, Theory of Elasticity I.*

2.806 Theory of Elasticity III

Approximate solutions for stress and displacement distributions in elastic solids; discrete solutions using finite difference and finite element methods; energy principles and the calculus of variations; relation of energy principles to the finite element method; use of energy principles to obtain approximate continuous solutions. *Prep. 2.805, Theory of Elasticity II.*

2.809 Introduction to Plasticity

Basic experimental information. Review of stress and strain tensors. Elastic stress-strain relations. Yield surface. Plastic stress-strain relations. Prandtl-Reuss equations. Simple applications. *Prep. 2.804 Elasticity or equivalent.*

2.810 Advanced Mechanics of Materials I

Review of fundamental stress and deformation concepts; strain energy density; introduction to variational techniques with application to beams, frames and rings; Rayleigh-Ritz method. *Prep. Admission to Graduate School of Engineering.*

2.811 Advanced Mechanics of Materials II

Beams on elastic foundation; stability analysis of beams by exact and approximate methods; bending and buckling of thin plates including use of Ritz Techniques. *Prep. 2.810.*

2.813 Advanced Mechanics of Materials III

Selected topics in solid mechanics; will vary with current interest. *Prep. 2.811.*

2.815 Plates and Shells

Bending of plates with various shapes, loads, and supports. Large deflection of plates. Membrane theory of shells. Analysis of cylindrical shells. General theory of thin elastic shells. Shells of revolution. *Prep. 2.806, Theory of Elasticity III.*

2.819 Fluid Dynamics I

The graduate sequence in fluid mechanics provides a rigorous introduction to the principles governing fluid motion. In the first course consideration is given to fluid statics, kinematics, and mass conservation. *Prep. Undergraduate fluid mechanics or permission of the instructor.*

2.820 Fluid Dynamics II

The second course examines conservation of momentum and energy employing integral formulations and including noninertial reference frames. *Prep. 2.819, Fluid Dynamics I.*

2.821 Fluid Dynamics III

Emphasis in this course is placed upon the governing differential equations. Topics selected may include potential flows, exact solutions of viscous flows, and approximate viscous-flow solutions appropriate to low and high Reynolds numbers, respectively. *Prep. 2.820, Fluid Dynamics II.*

2.823 Advanced Gas Dynamics

The consequences of fluid compressibility are studied. Shock waves and the theory of characteristics are discussed with specific consideration given to two-dimensional steady flows and one-dimensional unsteady flows. *Prep. 2.820, Fluid Dynamics II.*

2.824 Advanced Gas Dynamics

This course continues the subject matter of 2.823. Additional topics may include axially-symmetric steady flow, small-perturbation theory, similarity rules, the hodograph method, or some aspects of physical acoustics. *Prep. 2.823, Advanced Gas Dynamics.*

2.826 Mathematical Methods for Mechanical Engineers I

Bessel and Legendre functions; boundary-value problems and series of orthogonal functions. Partial differential equations and applications to heat transfer fluid flow, vibrations and wave propagation. *Prep. Admission to Graduate School of Engineering.*

2.827 Mathematical Methods for Mechanical Engineers II

Vector analysis; divergence theorem; functions of a complex variable; Laurent series and singular points; residues and contour integration; applications. *Prep. Admission to Graduate School of Engineering.*

2.828 Mathematical Methods for Mechanical Engineers III

Matrices and linear equations. Variational calculus and applications. Approximate methods of engineering analysis. Selected topics of current interest. *Prep. 2.826 and 2.827, Mathematical Methods for Mechanical Engineers I and II.*

2.829 Engineering Fracture Mechanics III

Application of fracture mechanics to fatigue, strain energy density criteria for fracture, arrest criteria. "Work of Fracture" specimen. Application of fracture mechanics to structural analysis. Effect of anisotropy in fracture mechanics. Fracture dynamics, dynamic fracture toughness, strain rate effects. Micro-second fracture phenomenon and criteria, spall, Butcher-Tuler criterion, NAG model. Residual strength, design approaches will be emphasized. *Prep. 2.839, Engineering Fracture Mechanics II.*

2.838 Engineering Fracture Mechanics I

Fundamentals of brittle fracture; theoretical strength, micro/macro fracture characteristic, Inglis-Griffith theory, applicability of same. Linear elastic fracture mechanics; Orewan/ Irwin extension to metals, effective surface tension and relation to fracture toughness, plastic zone size correction; geometry effects on fracture toughness; plane strain/plane stress fracture toughness, thickness effects. *Prep. Admission to the Graduate School of Engineering.*

2.839 Engineering Fracture Mechanics II

Experimental determination of fracture toughness; slow crack growth "popin", arrest, R-G curves, compliance techniques for determining elastic energy release rate. Alternate fracture toughness concepts; resistance curve, crack opening displacement, the J integral. Application of fracture mechanics to fatigue. Design methods to minimize risks of catastrophic failure will be emphasized. *Prep. 2.838, Engineering Fracture Mechanics I.*

2.840 Finite Element Analysis

Introduction to the finite element method. Variational formulations; simple interpolation functions and element stiffness matrices. Triangular and rectangular elements. Assembly technique and constraining of resulting equations. Elementary applications. *Prep. 2.826 and 2.827 or permission of instructor.*

2.841 Vibration Theory and Applications

Modeling of vibratory systems; one-degree-of-freedom systems (determination of equations of motion using free-body and energy methods); forced and free vibrations through two degrees of freedom; Laplace transformation techniques; phase-plane diagrams for undamped forced vibrations and Coulomb damping. *Prep. Admission to the Graduate School of Engineering.*

2.842 Vibration Theory and Applications

Multiple degrees of freedom; free and forced vibrations with or without damping, extensional and torsional oscillation, frequency equation, energy methods of solution. *Prep. 2.841, Vibration Theory and Applications or 2.861, Systems Engineering.*

2.843 Vibration Theory and Applications

Systems with distributed mass and stiffness; shock and impact; vibrations of beams and related structures; nonlinear and random vibrations. *Prep. 2.842, Vibration Theory and Applications.*

2.845 Shock, Vibration, and Noise Control

Theoretical and practical considerations pertinent to the design and protection of structures and equipment subject to severe environments of transient shock, steady state

vibration, random vibration, and acoustic noise. *Prep. 2.843, Vibration Theory and Applications.*

2.846 Nonlinear Vibrations

Studies of various nonlinear problems and the techniques used in solving them. Symmetrical and unsymmetrical systems. The Van der Pol-Kryloff-Bogoliuboff method as well as others will be discussed. *Prep. 2.843, Vibration Theory and Applications.*

2.847 Dynamics I

Application of fundamental laws of motion. Transformations of coordinate systems, kinematics of a particle using translating or rotating axis, LaGrange equations, space dynamics. *Prep. Admission to the Graduate School of Engineering.* See course 2.270.

2.848 Dynamics II

Dynamics of rigid bodies, moments of inertia in three dimensions, Euler's Equations, includes gyroscopic motion. *Prep. 2.847, Dynamics I.* See course 2.270.

2.849 Automatic Control Engineering

Concepts of feedback control; formulation of equations, transfer functions, and block diagrams representing components and systems; linearization; Laplace transformation; stability. *Prep. Admission to the Graduate School of Engineering.*

2.850 Automatic Control Engineering

Study of control action; analysis and design by use of root-locus and frequency-domain techniques. *Prep. 2.849, Automatic Control Engineering.*

2.851 Automatic Control Engineering

Further consideration of linear systems including compensation methods and multiple-inputs. Techniques for the treatment of non-linear systems. *Prep. 2.850, Automatic Control Engineering.*

2.853 Fundamentals of Instrumentation

Theoretical principles underlying the design and operation of instruments for measurement and/or control. Analysis of stimulus-response relations. Industrial instruments for measurement and control, including those based on pneumatic and electrical systems. *Prep. Bachelor of Science degree.*

2.854 Industrial Process Control

Fundamental principles involved in automatic control of industrial processes. Economic considerations. Application of control instruments to obtain automatic control of temperature, pressure, fluid flow, liquid level, humidity, pH. *Prep. 2.853, Fundamentals of Instrumentation.*

2.855 Solar Thermal Engineering I

A model is developed for the hourly direct and diffuse radiation under a cover of scattered clouds and the transmission and absorption of this radiation by passive and active systems. The design of air heating systems and the storage of the collected energy by a pebble-bed are considered, as well as elements of heat exchanger design. A study of the economics of a domestic water and/or space heating system is made using f-chart analysis. *Prep. 4.862, Solar Energy Thermal Processes or equivalent background.*

2.856 Solar Thermal Engineering II

The design and analysis of several solar thermal systems are considered, such as: LiBr-H₂O absorption cooling units, heat pumps, compound parabolic collectors, and the heat pipe type of solar collector. *Prep. 2.855, Solar Thermal Engineering I.*

2.901 Advanced Thermodynamics

A critical examination of equilibrium thermodynamics from a rigorous viewpoint emphasizing fundamental concepts including: equilibrium, heat, and work; the first and second law of thermodynamics; energy; heat engines, simple systems, and open systems.

Prep. Admission to the Graduate School of Engineering.

2.902 Advanced Thermodynamics

Continuation of 2.901 including: examination of temperature scales; entropy and availability; the phase rule, single component systems; thermodynamic relations. Consideration is also given to the ideal gas; chemical potential and thermodynamics of ideal gas mixtures. *Prep. 2.901, Advanced Thermodynamics.*

2.903 Advanced Thermodynamics (4 q.h. credits)

Embodies the material in 2.901 and 2.902 Advanced Thermodynamics. *Prep. Admission to the Graduate School of Engineering.*

2.904 Special Topics in Advanced Thermodynamics

Topics to be considered may vary from year to year depending on the interests of the instructor. Particular emphasis will be placed on the statistical approach in thermodynamics with topics chosen from: (i) equilibrium statistical mechanics; ensemble theory, partition functions, classical and quantum ideal gases, or (ii) kinetic theory of gases; simple kinetic theory, mean free path, transport phenomena, distribution functions, the Boltzmann equation, H-theorem, Chapman-Enskog expansion. *Prep. 2.902 or 2.903 and 2.826.*

2.905 Cryogenic Engineering

Designed to provide a familiarity with the general field of cryogenics, some of the principal uses of cryogenics, and the ways of obtaining and preserving an environment at a low temperature. Refrigeration, cycle analysis, heat exchanger design, insulation systems, properties of materials, instrumentation problems and applications. Problems will be assigned typical of those which are encountered in the field and laboratory.

Prep. Admission to the Graduate School of Engineering.

2.906 Cryogenic Engineering

Continuation of 2.905, Cryogenic Engineering. *Prep. 2.905, Cryogenic Engineering.*

2.907 Cryogenic Engineering

Application of Cryogenic Engineering Principles to the design of integrated systems. *Prep. 2.906, Cryogenic Engineering.*

2.910 Conduction Heat Transfer

The course topics are analytical solution methods for multidimensional systems in steady-state and transient conditions and an introduction to finite-difference numerical analysis.

Prep. Undergraduate course in heat transfer, or consent of instructor.

2.911 Convection Heat Transfer

The course topics are analytical and approximate integral solution methods to convection heat transfer problems. Internal and external flow problems are discussed for both laminar and turbulent flow conditions. *Prep. Undergraduate course in heat transfer and fluid dynamics, or consent of instructor.*

2.913 Radiation Heat Transfer

The course topics are the laws of thermal radiation and solution methods to radiative transfer between gray diffuse and gray specular surfaces. The problems of radiative transfer with conduction and convection heat transfer are discussed. *Prep. Undergraduate course in heat transfer.*

2.920 Direct Energy Conversion

The fundamental processes of direct energy conversion and their application to the design and operation of magnetohydrodynamic power generators, thermionic converters, and fuel cells. *Prep. Admission to the Graduate School of Engineering.*

2.921 Direct Energy Conversion

Continuation of 2.920. *Prep. 2.920, Direct Energy Conversion.*

2.923 Special Topics in Direct Energy Conversion

Irreversible thermodynamics. Unified theory of energy conversion. *Prep. 2.921, Direct Energy Conversion.*

2.930 Pumps

Deals mainly with centrifugal pumps, with brief references to other types; flow of fluids in pipes and conduits, system curves, pump head velocity diagrams and head development, efficiency; specific speed, net positive suction head, cavitation; affinity laws, selection of pumps to suit various operating conditions and methods of driving, parallel operation; automatic operation, types of construction and materials used, methods of priming centrifugal pumps, pumping of chemicals, oils, and sludges, special problems of pump installation and operation, water hammer in pump discharge lines. *Prep. Hydraulics.*

2.931 Fans and Blowers

Flow of air in pipes and ducts, fan characteristics and laws, various types of fan wheels, inlet and outlet connections, fan capacity control, fan selection and testing. Compression of air and gases, flow in pipes, head-on blowers, performance curves, effect of changes in speed and inlet conditions, construction, regulation, selection, installation, and testing. Axial flow fans and blowers. Positive pressure blowers. *Prep. Thermodynamics.*

2.935 Power Plant Design

Study of the thermodynamic cycles, equipment, and processes of the various types of power plants, with emphasis on modern central station practice. *Prep. Thermodynamics.*

2.936 Power Plant Design

Continuation of 2.935, Power Plant Design. *Prep. 2.935.*

2.938 Power Generation Economics

Integrated study of the various factors affecting cost of power generation, including the effects of fuels availability and pricing, equipment selection and plant efficiency, siting and financial considerations. *Prep. 2.935.*

2.942 Nuclear Engineering I

Topics include: growth of nuclear power industry; study of nuclear physics emphasizing atomic and nuclear structure, radioactive decay, and nuclear reactions with particular attention to fission and fusion; radiation health physics; principles of shielding; nuclear instrumentation; production and application of radioisotopes; neutron interactions and slowing down theory; neutron activation analysis. (Not open to students who have completed 2.236 & 2.237.) *Prep. Admission to Graduate School of Engineering.*

2.943 Nuclear Engineering II

Comparison of thermal, fast, and breeder reactors; four factor formula and the neutron diffusion equation; one-group, modified one-group, two-group and multi-group theory; bare and reflected thermal reactors; energy production and distribution within core; flux shaping; transient reactor behavior and control; factors affecting reactivity including temperature, pressure, void formation, fission product accumulation, fuel depletion and fuel breeding; Xenon buildup after shutdown. (Not open to students who have completed 2.236 & 2.237.) *Prep. 2.942.*

2.944 Nuclear Engineering III

Reactor design considerations; interrelationship of reactor physics, control, engineering, materials, safety, and fuel cycle management; reactor types; radiation damage and reactor materials; nuclear fuels; reactor heat transfer; economics of nuclear power; environmental effects. (Not open to students who have completed 2.236 & 2.237.) *Prep. 2.943.*

2.953 Advanced Physical Metallurgy III

The kinetics of phase transformations in metals. Topics include kinetic theory, empirical kinetics, diffusion in metals, nucleation, diffusional growth, martensitic transformations. *Prep. A recent introductory material science course.*

2.954 Advanced Physical Metallurgy I

Dislocation theory; including such topics as dislocation stress fields, self-energy, velocity, interactions mechanisms, image forces, and theories of yielding. *Prep. A recent introductory material science course.*

2.956 Advanced Physical Metallurgy II

Mechanical behavior of metals. Application of dislocation theory to micro-plasticity, strain hardening, strengthening mechanisms and creep. *Prep. 2.954, Advanced Physical Metallurgy I.*

2.958 The Structure and Properties of Polymeric Materials I

Introduction to the organic chemistry of polymers, effect of chemical composition on structure, melting point and glass transition temperature, polymer characterization and degradation, thermodynamics of polymers. *Prep. Undergraduate material science course.*

2.959 The Structure and Properties of Polymeric Materials II

Rheology and mechanical behavior of polymers, analysis and testing, effects of processing on structure and physical properties, industrial polymers, resin base composites. *Prep. 2.958*

2.960 Thermodynamics of Materials I

Basic metallurgical thermodynamics encompassing first, second, and third laws, entropy, enthalpy, and free energy. *Prep. Engineering Materials.*

2.961 Thermodynamics of Materials II

Continuation of 2.960 with emphasis on solutions, activity, activity coefficients, the phase rule and applications to some metallurgical problems. *Prep. 2.960, Thermodynamics of Materials I.*

2.963 Thermodynamics of Materials III

The application of metallurgical thermodynamics to various process metallurgical problems, i.e., gas-solid systems, etc., plus kinetics of reactions and dynamics systems analysis. *Prep. 2.960 or 2.961, Thermodynamics of Materials I or II.*

2.965 Physical Ceramics

Introduction to ceramic fabrication processes. Characteristic of vitreous and crystalline solids, structural imperfections, and atomic mobility. Phase equilibria, nucleation, crystal growth, solid-state reactions, non-equilibrium phases, and effects on the resulting microstructure of ceramics. *Prep. A recent introductory material science course, Physical Chemistry or Solid State Physics.*

2.966 Physical Ceramics

Discussion of effects of composition and microstructure on the thermal, mechanical, optical, electrical, and magnetic properties of ceramic materials. *Prep. 2.965, Physical Ceramics.*

2.970 Material Science and Engineering I

Principles underlying the structure and properties of solid materials. The relationships of these principles to the properties and to applications in structures and devices. Both macroscopic-phenomenological and electronic-molecular approaches will be used. Materials will include metals and alloys, semiconductors, and dielectrics. Typical subjects are atomic and electronic structures, ordering, nucleation, crystal growth, and thermal properties. *Prep. A recent introductory materials science course.*

2.971 Material Science and Engineering II

Continuation of 2.970 into additional topics such as thermal, electric, magnetic, and optical properties; applications of solid-state phenomena to achieve functions embodied in transducers, filters, amplifiers, energy converters, and so forth. *Prep. 2.970, Materials Science and Engineering I.*

2.972 Materials Science and Engineering III

Continuation of 2.971 plus a discussion of various special topics that will vary from year to year. Examples are: metastable phases and thin films. *Prep. 2.971, Materials Science and Engineering II.*

2.975 Introduction to Diffraction Methods in Materials Science

General principles of the diffraction of short wave length radiations; such as x-ray, electrons, and thermal neutrons by materials are studied with emphasis on the understanding of the similarities and differences of the different radiations when applied to the study of

the structures of crystalline and non-crystalline materials. *Prep. A recent introductory material science course.*

2.976 Diffraction Methods in Materials Science

Continuation of 2.975 with emphasis on the experimental methods and applications. This includes: choice of radiation, introduction to instrumentation, sample preparation, methods of detection and recording of the diffracted radiation, analysis, interpretation and use of the results. *Prep. 2.975, Introduction to Diffraction Methods in Materials Science.*

2.985 Powder Metallurgy

Powder characteristics and methods of manufacture. Powder pressing: packing, inter-particle bonding, effects of pressure. Principles of sintering. Characteristics and properties of products made from powdered materials. *Prep. A recent introductory material science course.*

2.990 Mechanical Engineering Seminar I (1 q.h. credit)

Introduce first year graduate students to graduate research and the mechanics of undertaking a Master's thesis; research opportunities in the various mechanical engineering disciplines; interdisciplinary research opportunities; definition of a research problem; the role of a thesis adviser; methods of conducting research; writing a Master's thesis. *Prep. Admission to Master of Science Program.*

2.991 Thesis (Master's Degree)

Analytical and/or experimental work conducted under the auspices of the department. Open to day students only. *Prep. Admission to Master of Science Program.*

2.992 Special Problems in Mechanical Engineering

Theoretical or experimental work under individual faculty supervision. *Prep. Consent of department chairman.*

2.993 Special Topics in Mechanical Engineering

Topics of interest to the staff member conducting this class are presented for advanced study. *Prep. Permission of department staff.*

2.994 Doctoral Reading

Material approved by the candidate's adviser (only S or F grades will be assigned for this course). *Prep. Passing of Ph.D. Qualifying Exam.*

2.995 Dissertation (Ph.D. Degree)

Theoretical and experimental work conducted under the supervision of the department. Open to day students only. *Prep. Admission to the Doctoral Program in Mechanical Engineering.*

2.996 Dissertation (Mechanical Engineer Degree)

Analytical and/or experimental work conducted under the auspices of the department. Open to day students only. *Prep. Admission to the Mechanical Engineer Degree Program.*

2.998 Mechanical Engineering Seminar II

Graduate students in their final Master's year will present current results of their thesis work. Non-thesis students will present reports on scientific work that they have pursued

in the past or have studied in technical literature. *Prep. 2.990, Mechanical Engineering Seminar I.*

ELECTRICAL ENGINEERING

Prerequisite courses and advanced undergraduate courses will not be given credit unless approved by an academic adviser. Approval must be made on a graduate engineering petition form and submitted to the Graduate Engineering office. A maximum of four quarter hours of credit at this level may be applied toward a Master's degree. All electrical engineering courses listed below and courses from other departments that are of an advanced undergraduate or prerequisite level are indicated by an asterisk (*) and apply to the four quarter hour maximum regulation.

3.800 Plasma Engineering

Behavior, diagnostics, and generation of plasma and gas discharges; emphasis on the engineering and experimental point of view rather than on a rigorous theoretical treatment. Current literature on a variety of plasma engineering applications will be introduced throughout the course. First quarter topics include: dynamics of charged particles in static electric and magnetic fields, E and M wave-plasma interactions, Infinite and Finite Media, elastic and inelastic collisions. *Prep. Bachelor of Science degree in Electrical Engineering or Physics or 3.977, Precis of Modern Electrical Engineering III.*

3.801 Plasma Theory I

Plasma electrodynamics and linear response theory. Fluid and Vlasov descriptions of plasmas with and without magnetic fields. Dispersion and damping of collective modes. Beam-plasma linear instabilities and application to shock wave structures. *Prep. 3.876 Electromagnetic Theory II*

3.802 Plasma Theory II

Plasma electrodynamics and nonlinear response theory. Fluctuation-Dissipation theorems. Sum rules. New approaches to strongly correlated plasmas: equation of state, liquid-solid phase-transitions, dispersion and damping of collective modes. Role of strongly correlated plasmas in laser- and heavy particle beam-inertial confinement schemes in thermonuclear fusion. *Prep. 3.801 Plasma Theory I.*

3.803 Plasma Theory (4 q.h. credits)

Offered days. Includes the material given in 3.800 and 3.801 — Plasma Engineering and Plasma Theory I. *Prep. Bachelor of Science degree in Electrical Engineering or Physics or 3.977, Precis of Modern Electrical Engineering III.*

3.806 Lasers I

Review of basic optical principles and atomic physics; introduction to optical coherence; models for the interaction of electromagnetic radiation with matter; a general description of lasers is given. *Prep. Bachelor of Science degree in Engineering or Science.*

3.807 Lasers II

Laser threshold and rate equations; elementary resonator theory and fabrication; giant pulse operation; specific solid-state, liquid, and gas lasers; and laser systems.

Prep. 3.806, Lasers I.

3.808 Laser Applications

Applications of lasers and laser systems for a variety of engineering and basic science disciplines; specific laser optoelectronic devices. *Prep. 3.807, Lasers II or equivalent.*

3.810 Thermonuclear Fusion Energetics I

Application of the concepts developed in 3.800 and 3.801 to the problem of thermonuclear plasmas. Emphasis will be on magnetic confinement schemes. Both open (mirror machines) and closed (torroidal confinement machines) systems will be discussed.

Prep. 3.801, Plasma Theory I.

3.811 Thermonuclear Fusion Energetics II

Continuation of magnetic confinement schemes. Trapped particle instabilities and anomalous transport effects will be discussed. Introduction to interfacial confinement (laser fusion). *Prep. 3.810, Thermonuclear Fusion Energetics I.*

3.812 Thermonuclear Fusion Energetics III

Introduction to Microinstabilities associated with laser fusion devices. Introduction to computer modeling of plasmas. Discussion of recent advances in thermonuclear plasma generation by relativistic electron beams. *Prep. 3.802, Plasma Theory II; 3.811, Thermonuclear Fusion Energetics II.*

3.817 Acoustics I

Radiation, transmission, and absorption phenomena of plane, spherical, and cylindrical waves. Distributed system analogies with digital computer solutions for complex systems.

Prep. Bachelor of Science degree in Engineering.

3.818 Acoustics II

Sound system engineering, including loudspeakers, microphones, and acoustic measurements. Environmental acoustics, including speech, hearing, noise, and room acoustics. *Prep. 3.817.*

3.819 Acoustics III

Ray acoustics. Ultrasonic and sonar transducers. Properties of transducer arrays. Underwater radiation, transmission, and absorption phenomena. *Prep. 3.818*

3.823 Mathematical Methods in Electrical Engineering (4 q.h. credits)

This course, offered days, includes the material in 3.8C4 and 3.8C5, Mathematical Methods in Electrical Engineering III and IV. *Prep. Bachelor of Science degree in Engineering.*

3.824 Linear Systems Analysis I

A study of the basic concepts of linear systems from the functional viewpoint. The time domain and transform techniques of analysis and their application to the study of filters and feedback systems. *Prep. Bachelor of Science degree in Electrical Engineering or equivalent.*

3.825 Linear Systems Analysis II

Introduction to the state variable theory of continuous and discrete linear systems. Standard canonical representations. The concept of state and the representation of interconnected systems. Linear spaces. The state equations and their solution. Stability. Introduction to the general control problem in terms of controllability and observability. *Prep.* 3.824 or equivalent.

3.826 Linear Systems Analysis III

A continuation of 3.825. *Prep.* 3.825, *Linear Systems Analysis II*.

3.827 Linear Systems Analysis (4 q.h. credits)

Offered days. Includes the material given in 3.825 and 3.826, *Linear Systems Analysis II and III*. *Prep.* *Bachelor of Science degree in Electrical Engineering and 3.824, Linear Systems Analysis I or equivalent.*

3.830 Network Synthesis I-A *

Matrix circuit analysis including m-port parameter systems. Positive-real functions. Energy functions. Driving-point synthesis techniques for LC, RC, and RL networks. *Prep.* *Bachelor of Science degree in Electrical Engineering or 3.975, Precis of Modern Electrical Engineering I.*

3.831 Network Synthesis I-B *

Driving-point synthesis of RLC networks. Properties of two-port networks. Two-port synthesis, including the parallel ladder realization. Lattice synthesis. *Prep.* 3.830, *Network Synthesis I-A*.

3.832 Network Synthesis I (4 q.h. credits)

Offered days. Includes the material given in 3.830, *Network Synthesis I-A* and 3.831, *Network Synthesis I-B*. *Prep.* *Bachelor of Science degree in Electrical Engineering or 3.975, Precis of Modern Electrical Engineering I.*

3.833 Network Synthesis II

Scattering, immittance, and hybrid formalisms for linear networks; state-space formulation and techniques for time-invariant and time-varying networks; introduction to passive n-port synthesis. *Prep.* 3.831, *Network Synthesis I-B* or 3.832, *Network Synthesis I*.

3.837 Graph Theory

Fundamentals of graph theory, including blocks, trees, connectivity, partitions, traversability, line graphs, factorization, coverings, planarity, matrices, digraphs, and enumeration problems. Selected applications of graph theory in such fields as network theory, switching theory, and computer science. *Prep.* *Bachelor of Science degree in Engineering or Science.*

3.838 Nonlinear Circuit Analysis I

Numerical, graphical, and analytical methods for the solution of physical systems described by nonlinear differential equations. Geometric analysis in second-order systems.

* Both A & B courses must be successfully completed to receive credit.

Perturbation and averaging theory. *Prep. 3.831, Network Synthesis I-B or 3.832, Network Synthesis I.*

3.839 Nonlinear Circuit Analysis II

Linear, time-varying systems and their relationship to certain nonlinear problems. The WJKB approximation. The Hill and Mathieu Equations. Stability of nonlinear systems. Lyapunov Theory. Selected topics in nonlinear analysis according to group interest. *Prep. 3.838, Nonlinear Circuit Analysis I.*

3.840 Linear Active Circuits I

Active compound circuits with emphasis on IC circuit topologies are developed as an extension of known discrete active device characteristics. Use is made of modern circuit theory techniques, including glowgraphs, matrices, Blackman's formulation for feedback and frequency response in terms of natural frequencies to determine compound circuit limitations. Models of IC operational amplifiers, instrumentation amplifiers, voltage comparators, and the like are developed and analyzed. Advantages and limitations of these IC active circuits are investigated. *Prep. Bachelor of Science degree in Electrical Engineering or 3.976, Precis of Modern Electrical Engineering II.*

3.841 Linear Active Circuits II

The topics of 3.840 are continued with emphasis on IC operational amplifiers, advantages and limitations including dynamic range, overload characteristics, and slow rate. Gain-bandwidth and speed characteristics are investigated for large and small signal conditions. Feedback, stability, and compensation in closed-loop systems and effects of feedback on impedance levels are explored. Applications for analog signal processing and conditioning, i.e. active filter design, summing, integration and coefficient amplifiers are investigated. Limitations caused by shot and thermal noise, definition of noise figure, and noise models are taken up. *Prep. 3.840, Linear Active Circuits I.*

3.842 Linear Active Circuits (4 q.h. credits)

Offered days. Includes all the material given in 3.840 and 3.841 Linear Active Circuits I and II, plus additional topics as time permits. *Prep. Bachelor of Science degree in Electrical Engineering.*

3.843 Linear Active Circuits III

A continuation of the material covered in Linear Active Circuits I and II. Emphasis will be placed on feedback systems, including multiloop amplifier design. These techniques will be applied to integrated circuit realizations of basic active networks. *Prep. 3.840, Linear Active Circuits I or 3.841, Linear Active Circuits II.*

3.845 Active Network Synthesis

Basic methods of active network synthesis are introduced through three commonly used approaches: feedback amplifier, negative impedance convertor, and gyrator; structures of Sallen and Key, Kuh, Linvill, Yanagisawa, Rohrer, Kinariwals, Sepress, and Calahan; consideration of the practical realization of NIC's and gyrators, standard decomposition methods and sensitivity; work of Sandberg, Larky, Newcomb, Daniels, Horowitz, and Thomas. *Prep. 3.831, Network Synthesis I-B and 3.841, Linear Active Circuits II or equivalent.*

3.853 Solid State Device Theory and Practice (4 q.h. credits)

This course meets twice weekly. On one night there is a two-hour lecture; on the other, a three-hour lab. The course carries four quarter hours of credit.

A case method study of solid state devices with a laboratory tightly integrated with the classroom work. The methodology developed is fundamental to the discrete and integrated circuit technology. The classroom portion of the course is devoted to junction diode and bipolar transistor theory including the physics of achieving a given design. In the laboratory, the student designs, builds, and tests diodes and transistors to meet certain electrical characteristics. The devices achieved are seldom of commercial quality, but sufficient equipment is available in the laboratory to make practical device processing possible even for completely untrained personnel. *Prep.* *An undergraduate level background in electronics and semiconductor devices.*

3.854 Solid State Theory and Practice (4 q.h. credits)

The course is offered on the same basis as 3.853 and is a continuation of that course. The central topic is field effect transistors with appropriate design problems for the laboratory. *Prep.* *3.853, Solid State Device Theory and Practice.*

3.8G1 Characteristics and Models of Solid State Devices I

This sequence of three courses is designed to develop real insight into the operation of a broad range of semiconductor devices. Important topics in the physics of semiconductors to provide the background necessary for device analysis are discussed. Analysis of fundamental building-block units of which devices are made including the PN junction, the ohmic contact and the Schottky barrier. Each is examined under reasonable extremes of bias and temperature to establish the electrical behavior expected from such elementary units. *Prep.* *Bachelor of Science degree in Electrical Engineering or equivalent.*

3.8G2 Characteristics and Models of Solid State Devices II

Detailed analysis of the bipolar transistor, metal-oxide-semiconductor interface, its influence on the behavior of real junctions, and the various realizations of the field-effect transistor. *Prep.* *3.8G1, Characteristics and Models of Solid State Devices I.*

3.8G3 Characteristics and Models of Solid State Devices III

A continuation of the work of the previous two courses. A detailed analysis of the performance of FET's will permit a critical comparison of field effect and bipolar transistors. Solid state microwave devices; devices that are both unique to microwave applications and the relevant low-frequency elements which require somewhat different analysis at microwave frequencies. An examination of noise in semiconductor devices. *Prep.* *3.8G2, Characteristics and Models of Solid State Devices II.*

3.860 Pulse Processing I

The principles and techniques of pulse-forming and pulse-processing circuits will be developed. Pulse forming, switching and time base generators will be covered. *Prep.* *Bachelor of Science degree in Electrical Engineering or 3.975, 3.976, and 3.977, Precs of Modern Electrical Engineering I, II, and III.*

3.861 Pulse Processing II

Continuation of 3.860, Pulse Processing I, to include the pulse processing circuits and the analog/digital interface techniques in radar, digital computation and data processing systems. *Prep.* *3.860, Pulse Processing I.*

3.865 Radar Systems I

Emphasis on the systems aspects of radar engineering. Topics covered include basic theory of radar detection, measurement of range, angle, and Doppler shift; classes of radar systems; types of radar noise; components of a radar system; matched filters and correlation receivers as applied to radar systems; fundamental ideas of radar system analysis. *Prep. 3.901, Applied Probability and Stochastic Process II or 3.902, Applied Probability and Stochastic Processes.*

3.866 Radar Systems II

Continuation of 3.865, Radar Systems I. In-depth study of search radar theory; maximum likelihood estimation approach to measurement of radar target parameters; resolution and ambiguity functions applied to radar; radar parameter uncertainty principles. *Prep. 3.865, Radar Systems I.*

3.867 Radar Systems III

Advanced topics in radar systems engineering. Topics to be covered will be dictated somewhat by student interest and level of preparation. These may include, for example, design considerations for multistatic radar systems synthetic aperture radars; tracking systems; radar waveform synthesis; multifunction array radar techniques and selected topics in radar sensing techniques and devices. *Prep. 3.865, Radar Systems I, and 3.866, Radar Systems II.*

3.871 Communications Systems I

Primarily concerned with radio communication systems as used in terrestrial and space communication applications. Antenna gain, space loss, cosmic and atmospheric noise, and receiver noise as factors influencing the signal-to-noise ratio in space and satellite repeater systems; channel models are developed for over the horizon systems utilizing ionospheric propagation and exhibiting fading and multipaths; contemporary systems are discussed from the standpoint of signal spectrum, noise power and message ambiguity as exhibited at the output of the intermediate frequency receiver. *Prep. Background in probability and Fourier analysis.*

3.872 Communications Systems II

Primarily concerned with the theoretical aspects of analogue modulation systems used in radio and space communications. First and second threshold effects will be discussed in conjunction with signal-to-noise considerations for amplitude and angle modulated systems. Treatment of frequency feedback and phase-lock loops will be included in the discussion of frequency modulation and detection. Frequency division multiplexing will include sub-carrier pre-emphasis and comparative performance figures for SSSC/FM and FM/FM. *Prep. 3.871, Communications Systems I or 3.900, Applied Probability and Stochastic Processes I.*

3.873 Communications Systems III

Continuation of techniques of 3.872 to cover digital modulation systems and time division multiplexing. Adaptive sampling, aliasing, and interpolation will be discussed along with PAM/FM. Pulse code modulation systems utilizing frequency and phase shifted carriers will be compared under noise conditions. Treatment will be given to the use of codes with special correlation, modulation by sequences, and phase-coherent communication. *Prep. 3.872, Communications Systems II.*

3.875 Electromagnetic Theory I

Maxwell's equations and related electromagnetic laws and relations; basic properties of matter; electromagnetic potentials; the scalar and vector Poisson, D'Alembert, and Helmholtz equations; Green's functions; both mathematical and physical aspects of the theory and their relation to engineering applications. *Prep. Bachelor of Science degree in Electrical Engineering or 3.977, Precis of Modern Electrical Engineering III, Advanced Calculus, and Vector Analysis.*

3.876 Electromagnetic Theory II

Basic radiation phenomenon including retarded potentials, radiation from moving charges, electromagnetic energy, and energy-related theorems. Propagation of plane waves in media with real and complex constitutive parameters. Fundamental theory of guided waves. *Prep. 3.875, Electromagnetic Theory I.*

3.877 Electromagnetic Theory (4 q.h. credits)

Offered days. Includes the material given in 3.875 and 3.876, Electromagnetic Theory I and II. *Prep. Bachelor of Science degree in Electrical Engineering or 3.977, Precis of Modern Electrical Engineering III.*

3.878 Advanced Electromagnetic Theory I

More advanced approaches to problems in electromagnetic theory of interest to electrical engineers — for example: waveguide, antennas, diffraction, and scattering; approximation techniques for obtaining useful solutions of field theory problems including integral equation, perturbation, and variational techniques. *Prep. 3.876, Electromagnetic Theory II or 3.877, Electromagnetic Theory.*

3.879 Advanced Electromagnetic Theory II

Special relativity and relativistic electrodynamics. Radiation from moving charges. Statistical concepts and propagation in random media. Introduction to magnetohydrodynamics and plasma physics. *Prep. 3.878, Advanced Electromagnetic Theory I.*

3.880 Microwave Engineering Principles I

Review of electromagnetic theory concepts directly applicable to analysis of microwave devices and systems. Theory of transmission lines and waveguides. *Prep. Bachelor of Science degree in Electrical Engineering or Physics.*

3.881 Microwave Engineering Principles II

Continuation of 3.880. Circuit theory for waveguiding systems. Impedance matching and transformation. Passive microwave devices. Cavity resonators. *Prep. 3.880 or equivalent.*

3.882 Microwave Engineering Principles III

Advanced topics in microwave theory, the content to be determined in part by student interest. Topics to be covered may include propagation in anisotropic media; non-reciprocal and ferrite devices; beam-wave interactions; coupled mode theory; travelling wave devices; periodically loaded lines; couplers; polarizers; phase shifters; attenuators; microwave filter synthesis; microwave systems considerations. *Prep. 3.880 and 3.881 or equivalent.*

3.883 Advanced Electromagnetic Theory (4 q.h. credits)

Offered days. Includes the material given in 3.878 and 3.879 — Advanced Electromagnetic Theory I and II. *Prep.* 3.876, *Electromagnetic Theory II* or 3.877, *Electromagnetic Theory*.

3.886 Remote Sensing

The application of electromagnetic radiating for sensing the environment, subsurface geophysical exploration, and identifying remote objects. Basic goals are concerned with understanding the relevant electromagnetics in relation to the particular sensing system. Both time and frequency domain sensing systems will be covered. As time permits, the application of pattern recognition methods to electromagnetic sensing will be discussed. *Prep.* 3.876, *Electromagnetic Theory II* or 3.877, *Electromagnetic Theory*.

3.887 Three-dimensional Picture Processing

The application of computer, optical, and analytic methods in abstracting geometrical information from pictures. Pictorial presentation of data trains into multidimensional pictures. Methods will be studied for reconstructing three-dimensional objects from two-dimensional pictures. Applications will be in the areas of X-ray analysis, radar target identification, microscopy, and sensory perception. Students will have the chance to pursue individual projects during the term. *Prep.* *BS degree in Science or Engineering*.

3.890 Electromagnetic Wave Propagation I

Topics in wave propagation of prime importance in communications and space physics. Review of wave propagation in a homogeneous medium. Physical processes in the atmosphere. The formation and structure of the ionosphere. Basic magnetoionic theory. Propagation of waves in a spatially varying medium. Ray theory. *Prep.* 10.9N2, *Advanced Mathematics or equivalent*.

3.891 Electromagnetic Wave Propagation II

A two-course sequence covering topics in wave propagation that are of primary importance in communicators and space physics. It is to be expected that with the vast amount of material available in a very active and rapidly changing field, that there will be considerable variation in what is covered, depending on timeliness and class interest. Among topics that may be covered within the two-course sequence are: review of propagation in a homogeneous medium; physical processes in the atmosphere; formation and structure of the ionosphere; basic magnetoionic theory; propagation in spatially variable media; ray theory; applications of ionosphere propagation and reflection to radio communication. Effects of the geomagnetic field; irregularities ionospheric scatter; diversity techniques. *Prep.* 3.877 or 3.876.

3.893 Digital Computer Programming I

First quarter of a three-quarter sequence of systems programming and language processors. Topics include: machine structure, machine language, assembly language; assemblers, macros, macro-processors; searching and sorting; loaders; data structures, storage allocation; high-level languages; compilers; operating systems; management of memory, processors, devices; multiprocessing and multiprogramming. *Prep.* *B.S. degree in Engineering or Science and knowledge of a higher level programming language*.

3.894 Digital Computer Programming II

Continuation of 3.893. *Prep.* 3.893, *Digital Computer Programming I*.

3.895 Digital Computer Programming III

Continuation of 3.894. *Prep.* 3.894, *Digital Computer Programming II.*

3.898 Combinatorial Mathematics

An introductory course in applied combinatorial mathematics which treats selected topics in enumerative analysis. Particular subjects include permutations, combinations, generating functions, recurrence relations, and the principle of inclusion and exclusion. *Prep.* 3.8A1, *Mathematical Methods in Computer Science.*

3.899 Combinatorial Methods and Optimization Techniques

Continuation of 3.898 to cover Polya's theory of counting; selected topics in optimization techniques, which include transport networks, matching theory, linear programming, and an introduction to dynamic programming. *Prep.* 3.898, *Combinatorial Mathematics.*

3.8A1 Mathematical Methods in Computer Science

Algebraic concepts relevant to computer science; sets, relations, mapping, orderings, algebraic systems, Boolean algebras, groups, rings, finite fields, introduction to vector spaces and linear algebras over finite fields. *Prep.* *Bachelor of Science degree in Engineering or Science.*

3.8C1 Mathematical Methods in Electrical Engineering I

Complex variable theory; mapping by functions, definite and indefinite integrals, Cauchy integral formula, Laurent series, the residue theorem and branch points. Not open to Northeastern graduates who have completed 3.292. *Prep.* *Bachelor of Science degree in Engineering or Science.*

3.8C2 Mathematical Methods in Electrical Engineering II

A continuation of 3.8C1 that includes application of complex variable theory to Fourier theory, Hilbert transforms, and conformal transformations in the analysis of linear systems and in electrostatics; the Schwarz-Christoffel transformation, Poisson's integral formula and concept of analytic continuation. *Prep.* 3.8C1, *Mathematical Methods in Electrical Engineering I.*

3.8C4 Mathematical Methods in Electrical Engineering III

Linear algebraic equations; Gauss algorithm; linear operators in an n -dimensional vector space over infinite and finite fields; characteristic value problem minimal polynomial; functions of a matrix; equivalence, congruence, and similarity transformation canonical forms; polynomial matrices; Smith normal form; determinantal divisors; invariant polynomials elementary divisors; companion and Jordan canonical matrices; decomposition of a vector space into invariant subspaces with respect to a linear operator. *Prep.* *Bachelor of Science degree in Electrical Engineering.*

3.8C5 Mathematical Methods in Electrical Engineering IV

A continuation of 3.8C4. *Prep.* 3.8C4, *Mathematical Methods in Electrical Engineering III.*

3.8T0 Numerical Methods and Computer Applications (4 q.h. credits)

This course offered days covers the material in 3.8T1 and 3.8T2, Numerical Methods and Computer Applications I and II. *Prep.* *Bachelor of Science degree in Engineering, Mathematics or Physics, a working knowledge of FORTRAN.*

3.8T1 Numerical Methods and Computer Applications I

Survey of numerical methods applied to engineering and scientific problems with emphasis on machine implementation and problem solving; roundoff errors and cumulative errors; difference and summation calculus; roots of polynomials and nonlinear functions; orthogonal functions including polynomials, least squares, and Chebyshev approximation of functions; systems of algebraic equations, matrix notation, and machine implementation; inversion of matrices including iterative methods; sparse matrix techniques.

Prep. Bachelor of Science in Engineering, Mathematics, or Physics; a working knowledge of FORTRAN.

3.8T2 Numerical Methods and Computer Applications II

Interpolation; numeric quadrature; numeric integration of ordinary differential equations including predictor-corrector methods; stiff dynamic equations, partial differential equations, approximations, boundary value problems. *Prep. 3.8T1, Numerical Methods and Computer Applications I.*

3.8T3 Numerical Methods and Computer Applications III

Linear and dynamic programming, steepest descent and simplex methods, with application to nonlinear functions in n-dimensional space; eigenvalues and eigenvectors of matrices; approximate location of eigenvalues; stability; Routh-Hurwitz criterion; more specialized techniques including the fast Fourier transform, digital simulation of analog computation, system modelling, etc. *Prep. 3.8T2, Numerical Methods and Computer Applications II.*

3.8T7 Digital Signal Processing I

A two-quarter sequence demonstrating the theory and practice of modern signal processing techniques. Characteristics of discrete signals and systems; sampling and A/D conversion; difference equations; convolution; the z-transform, the Fourier transform and the discrete Fourier transform; fast Fourier transform algorithms; chirp z-transform algorithm; digital filter realizations; design techniques for IIR and FIR digital filters; computer programs for filter design; quantization effects in digital signal processing.

3.8T8 Digital Signal Processing II

Continuation of 3.8T7. *Prep. 3.8T7 Digital Signal Processing I.*

3.8T9 Digital Signal Processing (4. q.h. credits)

This course, offered days, embodies the material in 3.8T7 and 3.8T8, Digital Signal Processing I and II. *Prep. 3.824, Linear Systems Analysis I or equivalent.*

3.8U1 Digital Signal Processing III

A continuation of the precepts acquired in Digital Signal Processing I and II or equivalent. Estimation of power spectra; the periodogram; modified periodogram; parametric methods for estimation of the power spectrum; autoregressive models; the Levinson algorithm; maximum entropy method and the Burg algorithm; moving average and autoregressive-moving average models; maximum likelihood methods; applications of methods in communications, speech processing and seismic signal processing. *Prep. Digital Signal Processing I and II or equivalent.*

3.8U4 Special Topics in Digital Signal Processing—Fast Algorithms for Digital Signal Processing

Fast algorithms for implementation of digital filters and discrete Fourier transforms: FFT, convolution algorithm, Number Theoretic Transforms (NTT), filtering computation, and polynomial transforms. *Prep. 3.8T7 and 3.8T8, Digital Signal Processing I and II.*

3.8U7 Two-Dimensional Digital Signal Processing

This course is concerned with two-dimensional digital signal processing which is finding wide applications in many diversified areas. Covers 2-D shift invariant systems along with their stability, the 2-D Discrete Fourier Transform (DFT) and its FFT implementation, and 2-D digital filter design and implementation. *Prep. 3.8T7 and 3.8T8, Digital Signal Processing I and II.*

3.9A1 Error Correcting Coding I

Error correcting codes and their decoding techniques which show promise for applications in digital communication, control and computer systems. Emphasis placed on the linear block codes based on algebraic structures; cyclic codes for random error correction (B-C-H codes) and burst error correction. Some knowledge of elementary aspects of modern algebra is desirable but not necessary. Not to be taken by students who have completed 3.904. *Prep. Bachelor of Science degree in Engineering or Science.*

3.9A2 Error Correcting Coding II

Convolutional codes and decoding including the Viterbi algorithm, arithmetic codes. Combination of codes. Coding for ranging and synchronization. Not to be taken by students who have completed 3.908. *Prep. 3.9A1, Error Correcting Coding I or 3.905, Information Theory and Coding.*

3.9A6 Optimal Control Theory

Introduction to optimal control theory. Variational calculus development of the maximum principle. Minimum time, minimum fuel, and minimum energy problems. The optimal linear regulator problem and the matrix ricatti equation. *Prep. 3.826, Linear Systems Analysis III.*

3.9A7 Design of Optimal Control Systems

A further study of optimal control with emphasis on control system design. The output regulator problem, the tracking problem, and system pole allocation. Numerical solutions using dynamic programming and steepest-descent algorithms. *Prep. 3.9A6.*

3.9A8 Control Systems II (4 q.h.)

Includes material given in 3.9A6, Optimal Control Theory, and 3.9A7, Design of Optimal Control Systems. *Prep. 3.826, Linear Systems Analysis III.*

3.9B1 Digital Processing of Speech Signals

Models of speech production, waveform coding of speech, transform coding of speech and speaker recognition systems. *Prep. 3.8T7 and 3.8T8, Digital Signal Processing I and II.*

3.9C1 Digital Communications I

Deals with the theoretical and practical aspects of digital communications in the presence of channel distortion and additive noise. Topics covered in this quarter include the basic

binary and M-ary modulation techniques; namely, PSK, PAM, FSK, orthogonal and bi-orthogonal signals, and their performance in an additive Gaussian noise channel; signal waveforms constructed from binary block and convolutional codes; hard-decision decoding and soft-decision decoding of coded signal waveforms; performance of coded waveforms in an additive white Gaussian noise channel. *Prep. 3.901, Applied Probability and Stochastic Processes II or 3.902, Applied Probability and Stochastic Processes.*

3.9C2 Digital Communications II

Signal design techniques for band-limited channels; Nyquist criteria; effect of channel amplitude and delay distortion on digital signals; discussion of several adaptive equalization algorithms for combatting intersymbol interference; maximum likelihood sequence estimation and the Viterbi algorithm; the characterization of fading multipath channels; diversity reception techniques; coding for fading channels. *Prep. 3.9C1, Digital Communications I.*

3.9D1 Digital Image Processing I

An introduction to the generation and processing of digital images. The course emphasizes the random-vector nature of digital images and uses linear system theory, matrices, and probability theory to develop the various topics. These include the generation of a digital image from the source, through the optical system, to the detector; sampling and quantization of the optical signal; and the enhancement techniques such as histogram mapping, contrast boosting, and edge sharpening. *Prep. 3.901 or 3.902.*

3.9D2 Digital Image Processing II

A continuation of 3.9D1. Topics include image restoration by Weiner filtering, maximum entropy estimation, singular value decomposition, and spatially varying filters, image coding with Huffman codes, DPCM, Transform (Walsh, KL, discrete cosine) coding, run-length encoding, adaptive optics, feature analysis, and hardware for a typical digital image processing system. *Prep. 3.9D1, Digital Image Processing I.*

The two-part sequence which follows serves to introduce students in engineering and physics to the notions of probability, random variables and stochastic processes. The subject matter is given below.

3.9E1 Compiler Construction I-A *

Lexical analysis, parsing, syntax-directed translation, and code generation for modern block-structured programming languages. Case studies of translation to, and interpretation of, intermediate languages. *Prep. 3.986 and 3.893 or equivalent.*

3.9E2 Compiler Construction I-B *

Continuation of 3.9E1.

3.9Z1 Engineer's Degree Reading

To be taken upon completion of 30 q.h. of satisfactory course work. NO CREDITS TOWARDS COURSE REQUIREMENTS GIVEN. Students allowed to register for a minimum of 4 q.h./quarter, maximum of 8 q.h./quarter.

* Both A & B courses must be successfully completed to receive credit.

3.922 Electrical Engineer Degree Thesis

Prep. Admission to Engineer Degree Program.

3.923 Engineer's Degree Thesis Continuation

Candidates to sign up for thesis continuation if their thesis is not completed after they have registered for 3 consecutive quarters or 10 q.h. of EE degree thesis. Continuation registration is required until the candidate graduates.

3.900 Applied Probability and Stochastic Processes I

Introductory probability, sample space and random variables, examples of discrete and continuous probability distribution functions, averages, moments and characteristic function, multivariate distributions, change of variables and functions of variables, central limit theorem, description of stochastic vectors. *Prep. Bachelor of Science degree in Engineering or Science.*

3.901 Applied Probability and Stochastic Processes II

General concepts of stochastic processes, stationarity and ergodicity, stochastic continuity and differentiation, the Gaussian process, linear systems with stochastic inputs, correlation functions and power spectra, matched filtering, stochastic orthogonality and linear mean-square estimation filtering and prediction. *Prep. 3.900, Applied Probability and Stochastic Processes I.*

3.902 Applied Probability and Stochastic Processes (4 q.h. credits)

Includes the material given in 3.900, Applied Probability and Stochastic Processes I and 3.901, Applied Probability and Stochastic Processes II. *Prep. Bachelor of Science degree in Engineering or Science.*

3.903 Information Theory

Deals principally with three aspects of information theory; the statistical description of sources and the probabilistic measure of their information contents, the determination of channel capacity, and the fundamental coding theorems. *Prep. 3.900, Applied Probability and Stochastic Processes I or 3.902, Applied Probability and Stochastic Processes or Probability.*

3.905 Information Theory and Coding (4 q.h. credits)

Includes the material given in 3.903, Information Theory and 3.9A1, Error Correcting Coding I. *Prep. 3.900, Applied Probability and Stochastic Processes I or 3.902, Applied Probability and Stochastic Processes.*

3.906 Detection and Estimation Theory A *

This course presents the classical theory of detection and estimation of signals in noise with emphasis on computer implementation of the theory. Particular topics include: hypothesis testing criteria; coherent detection of M-ary signals; diversity receiver; calculation of error probabilities. *Prep. 3.901, Applied Probability and Stochastic Processes II or 3.902, Applied Probability and Stochastic Processes.*

* Both A & B courses must be successfully completed to receive credit.

3.907 Detection and Estimation Theory B *

This is a continuation of 3.906. Topics include: detection in colored noise; parameter estimation using Bayes, maximum-likelihood, and maximum a posteriori criteria; applications in pattern recognition and radar. *Prep.* 3.906, *Detection and Estimation Theory A*.

3.908 Special Topics in Communication Theory

Current aspects of communication theory not covered in previous courses. Subject matter may change from year to year.

3.909 Detection and Estimation Theory (4 q.h. credits)

Offered days. Includes the material given in 3.906 and 3.907, Detection and Estimation Theory A and B. *Prep.* 3.901, *Applied Probability and Stochastic Processes II* or 3.902, *Applied Probability and Stochastic Processes*.

3.910 Nonlinear Systems I

Operators and functionals. Functional power series representation of nonlinear systems. Functional representation of the response of a nonlinear system when its input is either a constant, a sinusoid, a transient. System transforms. Applications to the analysis and synthesis of nonlinear systems in terms of functional power series. *Prep.* An undergraduate course in *Signals and Systems* and 3.900, *Applied Probability and Stochastic Processes I* or equivalent.

3.911 Nonlinear Systems II

Nonlinear systems with random inputs. Functional representation of the response of a nonlinear system when its input is a random process. Orthogonal systems of functionals. Representation and analysis of nonlinear systems in terms of orthogonal systems of functionals. The optimum nonlinear filter, predictor, and general operator. Special classes of nonlinear systems. Determination of optimum nonlinear systems for generalized error criteria. *Prep.* 3.910, *Nonlinear Systems I* and either 3.901, *Applied Probability and Stochastic Processes II* or 3.902, *Applied Probability and Stochastic Processes*.

3.912 Nonlinear Systems III

Functional analysis of systems characterized by nonlinear differential equations. Operator approach to system theory and its relationship to differential equation representations. The methods of iteration in nonlinear theory and its application to feedback systems. *Prep.* 3.911, *Nonlinear Systems II*.

3.913 Optical Storage and Display

Survey of materials and methods for the storage and display of information. Topics included are: photographic film, holograms, storage tubes, magneto-optical films, photochromic materials, electro-optical crystals, evaporated thin films and liquid crystals. *Prep.* Bachelor of Science degree in *Engineering or Physics* or equivalent.

3.914 Electro-Optics I

Survey of the basic concepts necessary for understanding and evaluating the optics involved in electro-optical systems. The optical system as a linear system; matrix methods; diffraction and interference; imaging and aberrations. *Prep.* Bachelor of Science degree in *Engineering or Physics*.

3.915 Electro-Optics II

Survey of the basic concepts necessary for understanding electro-optical devices. Wave propagation in isotropic and nonisotropic media; optics of crystals; polarization; optical resonators; guided waves; modulators and detectors; thin film optics. *Prep. Bachelor of Science degree in Engineering or Physics.*

3.916 Fourier Optics I

This two-quarter sequence covers: optical diffraction and imaging problems as linear systems; necessary tools of Fourier Analysis and linear systems analysis which occur when solving the scalar wave equation; waves and their properties; reflection, refraction, polarization, and propagation of waves; foundations of scalar diffraction theory — including Fresnel and Fraunhofer diffraction, interferometry, division of amplitude, division of wavefront, interferometric instrumentation, Fourier transforming, image properties of lenses, coherent and incoherent imaging; and advanced topics in the application of communication theory to optical problems, transfer and spread functions, spatial filtering, and holography. *Prep. 3.915, Electro-Optics II or equivalent.*

3.917 Fourier Optics II

Continuation of 3.916. *Prep. 3.916, Fourier Optics I.*

3.921 Optical Properties of Matter I — Crystals

Optics of crystals; classification and effects of crystal symmetry on optical properties; classical description of wave propagation in crystals; applications of the theory to modulation, pulse generation, nonlinear optics. *Prep. Bachelor of Science in Engineering or Physics or equivalent.*

3.922 Optical Properties of Matter II

Introduction to electro-optical and magneto-optical effects in material media; linear and nonlinear optical materials; elasto-optic and acousto-optical materials; polarization and propagation effects; modulation. *Prep. 3.921, Optical Properties of Matter I — Crystals.*

3.923 Optical Properties of Matter III

Thin films and optical fibers; multilayer filters; dichroics; integrated optics. *Prep. 3.922, Optical Properties of Matter II.*

Additional courses on the optics sequence are 3.980, 3.981, 3.982, 3.983, and 3.984.

3.925 Power Circuit Analysis I

Fundamental concepts of single-phase and polyphase power systems; definitions of terms; use of per unit quantities; equivalent circuits of symmetrical 3-phase systems; introduction to symmetrical components; short circuits on systems with a single power source. *Prep. Bachelor of Science degree in Electrical Engineering.*

3.926 Power Circuit Analysis II

This course is a continuation of 3.925, Power Circuit Analysis I. Sequence impedances of various power-system elements are considered from application point of view; unsymmetrical faults on otherwise symmetrical 3-phase systems; open conductors and asymmetrical connections and loadings; analysis of simultaneous faults on 3-phase systems. *Prep. 3.925, Power Circuit Analysis I.*

3.927 Power Circuit Analysis III

This course is a continuation of 3.926, Power Circuit Analysis II. Introduction of Clarke components and applications in analysis of asymmetrical systems and faults; application of Clarke components to the solution of surge phenomena problems; transmission line theory; fundamentals of systems stability. *Prep.* 3.926, *Power Circuit Analysis II*.

3.928 Analysis of Power Systems (4 q.h. credits)

Offered days. This course is designed to provide the basic material, including special mathematical techniques, applicable to the solution of problems associated with power systems. The sequence-impedance characteristics of various power-system elements are investigated with emphasis on application rather than design. Abnormal situations including simultaneous faults and system transients are treated in depth, making use of Clarke components and modified Clarke components as well as symmetrical components. Polyphase transmission line theory, system protection and system stability are introduced and discussed briefly. *Prep.* Bachelor of Science degree in Electrical Engineering.

3.929 Solid State AC and DC Motor Control Systems

The application of solid-state devices to the control of AC and DC electrical machinery, including rectifiers, inverters, choppers and cyclo-converters, as applied to drive systems in industry and transportation. The course will emphasize a case method approach. *Prep.* A background in electric machinery.

3.930 Power System Planning

Engineering and economic considerations underlying the planning and development of modern interconnected power systems. Consideration of overall planning strategies involved in economic comparison of alternative development schemes. *Prep.* 3.925, *Power Circuit Analysis I*.

3.931 Power System Planning (4 q.h. credits)

Offered days. Includes the material given in 3.930 but with more extensive and in-depth coverage. *Prep.* 3.928, *Analysis of Power Systems or equivalent*.

3.932 Power Systems Protection

Consideration of protection applied to generation, transmission, and distribution. Investigation of the characteristics and operating principles of various methods of protective relaying; analysis of current techniques pertaining to system protection. *Prep.* 3.927, *Power Circuit Analysis III or equivalent*.

3.933 Power System Transients

Transients in power systems due to system switching, lightning, or faults. Traveling-wave phenomena; insulation coordination; overvoltages due to disturbances on the system; surge protection. *Prep.* 3.927, *Power Circuit Analysis III or equivalent*.

3.935 Computers in Power Systems I

Techniques used in solving power system problems with the digital computer. Matrix formulations are examined, followed by a detailed treatment of the short-circuit problem, including balanced and unbalanced faults. Various iterative techniques are studied for the solution of the power-flow problem. *Prep.* Bachelor of Science degree in Electrical Engineering or equivalent.

3.936 Computers in Power Systems II

Practical considerations of solving large scale networks are discussed. Network reductions, distribution factors and contingency analysis techniques are developed. Digital models for regulated generators, fixed and load tap changing transformers and HVDC transmission lines are examined. Computer methods for economic dispatch, loss coefficients and application of pumped hydro are developed. *Prep. 3.935, Computers in Power Systems I.*

3.940 Electric Machinery Theory I

Review of magnetic circuit concepts and electromechanical energy-conversion principles; steady-state analysis of transformers, synchronous machines, and induction machines. *Prep. Bachelor of Science degree in Electrical Engineering or 3.975, 3.976, and 3.977, Precis of Modern Electrical Engineering I, II, and III.*

3.941 Electric Machinery Theory II

Mathematical description of a synchronous machine; per-unit representation; steady-state theory and transient performance; flux distribution and saturation in synchronous machines. *Prep. 3.940, Electric Machinery Theory I.*

3.942 Electric Machinery Theory III

Review of transient behavior of synchronous machines; stability studies and excitation systems; synchronous machine modeling; generator protection; trends in development of large generators. *Prep. 3.941, Electric Machinery Theory II.*

3.943 Advanced Power Laboratory

Offered days. In-depth investigations of the steady-state and dynamic modes of operation of rotating machines. Polyphase rectification and control circuits. Experimentation in other related power areas. *Prep. Bachelor of Science degree in Electrical Engineering.*

3.944 Special Topics in Power

Offered days. (Part-time students may enroll in this course only by special arrangement.) Directed reading and discussion of topics of special interest in the power field. Series of lectures by guest speakers from industry on topics of particular interest to the power student. *Prep. Permission of instructor.*

3.945 Power System Dynamics

Transient system models; small and large scale oscillations; solution of swing equation for single and multi-generator cases; load frequency and voltage controllers and transient stability. *Prep. 3.927, Power Circuit Analysis III or equivalent.*

3.950 Systems Analysis I-A *

Review of probability and statistics. Elements of Markov processes, queuing as a Markov process. Finite and infinite queue systems, multiple-server, parallel and sequential queuing; fundamentals of reliability theory. *Prep. Bachelor of Science degree in Engineering or Science.*

* Both A & B courses must be successfully completed to receive credit.

3.951 Systems Analysis I-B *

Flow-graph representation of queuing systems, equivalence of flow-graph and analog-computer representation; fundamental concepts in game theory; solution of rectangular games; pure and mixed strategies, maximin and minimax principle; zero and non-zero-sum games, infinite games; transformation of games into linear programming problems. Other methods of solving competitive-situation problems. *Prep. 3.950, Systems Analysis I-A.*

3.952 Systems Analysis II

Modelling of systems problems in terms of linear programming approach. Transportation problem; graphical representation and solution of linear-programming problems; allocation problem; simplex method; concept of duality and its use in linear programming. *Prep. 10.8A4, Advanced Mathematics or 10.9N2, Advanced Mathematics.*

3.953 Systems Analysis III

Optimization of stochastic systems. Markov-process approach to the analysis of probabilistic systems. Z-transform analysis of Markov processes. Solution of sequential decision processes by value and policy iteration. Single-chain and multi-chain systems. Sequential decision processes with discounting. Machinery and car replacement problem, and other applications. *Prep. 3.950, Systems Analysis I-A, 3.952, Systems Analysis II, 10.8G1, Probability or equivalent.*

3.954 Systems Analysis (4 q.h. credits)

Offered days. Includes the material given in 3.950 and 3.951 — Systems Analysis I-A and I-B. *Prep. Bachelor of Science degree in Engineering or Science.*

3.955 Studies in Electric Power Transmission I

Elements in the design of AC overhead transmission lines; thermal limitations, series and shunt compensation, environmental effects; consideration of transposition, induced effects, and insulation level. Underground alternatives to overhead lines. Elements of distribution. *Prep. 3.927, Power Circuit Analysis III or equivalent.*

3.956 Studies in Electric Power Transmission II

Fundamental concepts of high voltage DC power transmission; rectifier and inverter performance; regulation; protection; reactive power and filter requirements; practical arrangement of DC lines; the impact of a DC line on overall power system operation. *Prep. 3.927, Power Circuit Analysis III or equivalent.*

3.957 Control System Analysis

Classical analysis techniques for continuous and sampled-data control systems. Discussion of stability criteria; application of root-locus and Bode methods for complementary time and frequency-domain analysis. Computer simulation of typical control systems will be emphasized. *Prep. Bachelor of Science degree in Engineering; knowledge of transform analysis and some familiarity with FORTRAN.*

3.958 Control System Synthesis

A review of cascade and feedback compensation techniques with the use of classical criteria for design of continuous and sampled-data control systems. Consideration of the multiple-input problem. A survey of pole-zero synthesis methods; and comparison with

other techniques. Computer simulation of design examples. *Prep.* 3.957, *Control System Analysis or equivalent.*

3.959 Control Systems I (4 q.h. credits)

Includes the material given in 3.957, Control System Analysis and 3.958, Control System Synthesis. Open to qualified undergraduate students. *Prep.* Knowledge of transform analysis and some familiarity with FORTRAN.

3.963 Stochastic Control Theory

Statistical models for random signals; representation of dynamic systems excited by stochastic inputs. Optimal filtering, prediction and smoothing for discrete and continuous systems. Observer theory and feedback of estimated states for effective closed-loop control in a noisy environment. *Prep.* 3.900, *Applied Probability and Stochastic Processes I* and 3.826, *Linear Systems Analysis III.*

3.964 Estimation, Identification, and Control

Estimation theory for dynamic systems based on Bayesian and maximum likelihood methods. The system identification problem. Implementation of numerical algorithms for parameter identification and adaptive control. *Prep.* 3.963, *Stochastic Control Theory.*

3.965 Control Systems III

Includes the material given in 3.963, Stochastic Control Theory and 3.964, Estimation, Identification, and Control. *Prep.* 3.900, *Applied Probability and Stochastic Processes I* and 3.826, *Linear Systems Analysis III.*

3.966 Switching Theory I (4 q.h.)

This course offered days covers the material in 3.967 and 3.968, Switching Theory I-A and I-B. *Prep.* 3.8A1 *Mathematical Methods in Computer Science.*

3.967 Switching Theory I-A *

Logical design of combinational switching circuits, including minimization and decomposition of switching functions; multiple output networks; symmetric networks; threshold logic, fault detection. Logic design of sequential switching circuits including finite-state machine model; iterative networks; capabilities and limitations of finite-state machines; state equivalence; synthesis of asynchronous sequential circuits; state assignment problem and partition theory; machine decomposition. *Prep.* Bachelor of Science degree in Engineering or related science.

3.968 Switching Theory I-B *

Logical design of sequential switching circuits, including the finite-state machine model; iterative networks; capabilities and limitations of finite-state machines; state equivalence; synthesis of asynchronous sequential circuits; state assignment problem and partition theory; machine decomposition. *Prep.* 3.967, *Switching Theory I-A.*

3.969 Switching Theory II

Selected topics from the theory of finite automata, including such topics as machine experiments; information lossless machines; linear sequential machines; finite-state recognizers. *Prep.* 3.968, *Switching Theory I-B* or 3.966, *Switching Theory I.*

* Both A & B courses must be successfully completed to receive credit.

3.972 Digital Computer Design I-A ***3.973 Digital Computer Design I-B ***

These courses are directed towards the design of a complete computer in register transfer language. Analysis and synthesis of combinational and sequential circuits. Organization and detailed logic design of an elementary digital computer. Other topics may include bus organization, interfacing with asynchronous peripherals, digital logic families, hardware/software tradeoffs, address modes, and memory hierarchies. *Prep. Bachelor of Science degree in Engineering or related science.*

3.974 Digital Computer Design II

Topics in microprogramming and emulation including microprogramming concepts and techniques; microprogramming design approach using register transfer notation and precedence graphs; microprogrammed computers, bit-slice microprogramming, microprogramming a specific machine for emulation using a microprogramming language and its simulator; current trends in microprogramming languages and support tools. *Prep. 3.973, Digital Computer Design I-B.*

***3.975 Precis of Modern Electrical Engineering I**

Prep. Bachelor of Science degree in Engineering or Science plus knowledge of matrix algebra.

***3.976 Precis of Modern Electrical Engineering II**

Prep. Bachelor of Science degree in Engineering or Science.

***3.977 Precis of Modern Electrical Engineering III**

Prep. Bachelor of Science degree in Engineering or Science.

***3.978 Precis of Modern Electrical Engineering IV**

Prep. Bachelor of Science degree in Electrical Engineering or Science.

The preceding four precis courses are intended primarily for those whose undergraduate major was in an engineering or scientific field other than electrical engineering. They are also recommended for students 5 to 10 years away from their bachelor's degree in electrical engineering who feel the need for a review of electrical science. They are open only to students in these categories. The material is basically undergraduate in nature but the viewpoint and depth are at the mature level appropriate to graduate students. Part I deals with the theory of electric circuits and linear systems, Part II with electronics, Part III with field theory from the engineering viewpoint, and Part IV with communication theory especially spectral analysis correlation and modulation.

3.979 Digital Computer Design (4 q.h. credits)

This course, offered days, embodies the material in 3.972 and 3.973, Digital Computer Design I-A and I-B. *Prep. Bachelor of Science degree in Engineering or related Science.*

3.980 Optical Instrumentation Design Concepts

An introduction to the design of optical instrumentation. Principles and basic concepts rather than a rundown of known optical systems. In sequence the topics are: introduction,

* Prerequisite courses.

mechanical shock and vibration, kinematic designs, application of third order aberrations, simple optical ray tracing, optical testing, tolerances, optical instrumentation, philosophy, functional design, design for quantity production, quality assurance, "special order" design, industrial design, examples and exercises. *Prep. Bachelor of Science degree in Engineering or Physics or equivalent.*

3.981 Principles of Optical Detection I — Application

Laws governing radiation and radiometry; properties of real radiation sources; detailed description of detection devices (image forming and signal generating); noise; contrast and MTF; detection systems (imaging devices and ranging devices); electro-optical detector systems analysis. *Prep. Bachelor of Science degree in Engineering or Physics or equivalent.*

3.982 Principles of Optical Detection II — Theory

Review of detector parameters; statistics of detector noise; practical considerations in real detectors; detection, resolution and recognition of signals; heterodyne detection and parametric amplification; sub-nanosecond pulse detection calibration of electro-optical detectors; detectors as system components. *Prep. Bachelor of Science degree in Engineering or Physics or equivalent.*

3.983 Fourier Optics III

The third in a series covering current topics of interest in this field and optical instrumentation. Application of coherence phenomena to optical instrumentation such as microdensitometers, microscopes, viewers, cameras, spectrophotometric and interferometric instruments; applications of holography, optical data processing and computing, holographic memories, optical modulation, noise and its effects on data collection, synthetic aperture optics and medical application of laser optics. *Prep. 3.917, Fourier Optics II.*

3.984 Spectroscopic Instrumentation

Survey of optical instrumentation employed in analysis and control situations; modern methods of spectrometry and interferometry; optimization of analytical systems; topics in electron spectroscopy, X-ray spectroscopy, microwave spectroscopy, and related fields. *Prep. Bachelor of Science degree in Engineering or Science.*

3.985 Fundamentals of Language and Machine Theory I

First of a three-quarter sequence in theoretical models of languages and computation. Topics include: formal grammars, parsing, lexical analysis techniques; syntax-directed translation schemes; regular and context-free languages; finite automata, pushdown automata; more general languages and their corresponding machine recognizers; an introduction to computability theory; solvability and unsolvability; computational complexity considerations. *Prep. 3.8A1, Mathematical Methods in Computer Science.*

3.986 Fundamentals of Language and Machine Theory II

Continuation of 3.985 *Prep. 3.985, Fundamentals of Language and Machine Theory I.*

3.987 Fundamentals of Language and Machine Theory III

Continuation of 3.986 *Prep. 3.986, Fundamentals of Language and Machine Theory II.*

3.988 Special Topics in Computer Science

Aspects of Computer Science not covered in other courses. The subject matter may change from year to year.

3.989 Computer Peripherals

Survey of various types of modern computer peripherals, systems considerations, displays (CRT; control units, editing features, graphics, etc.); mass storage (magnetic surfaces; flying heads, recording techniques, disks; file organization, search strategies, mass storage, software, etc.); communications terminals (modems, control procedures, store and forward, multiplexers, etc.); tape units (types, consideration of cost vs. performance, tape labels and formats, magnetic recording on tapes, design features, etc.); future trends in peripherals. *Prep. Bachelor of Science degree in Electrical Engineering or related engineering or sciences.*

3.990 Seminar I

A library survey of a selected topic in the general field of electrical engineering with an oral presentation based on this survey. Participation in the departmental seminar program of guest lectures. *Prep. Bachelor of Science degree in Engineering or Science.*

3.991 Seminar II

The preparation of a research paper suitable for publication in a professional journal, plus an oral presentation of this report. *Prep. 3.990, Seminar I.*

3.993 Doctoral Seminar I (non-credit)

This requirement will be satisfied by the student presenting a seminar to the Electrical Engineering Department on a subject related to his/her Ph.D. thesis. The thesis supervisor will coordinate the seminar. *Prep. Passing of Ph.D. Qualifying Exam.*

3.995 Master's Thesis

Analytical and/or experimental work conducted under the auspices of the department. *Prep. Bachelor of Science degree in Engineering or Science.*

3.996 Doctoral Thesis

Theoretical and/or experimental work conducted under the auspices of the department. *Prep. Passing of Ph.D. Qualifying Exam.*

3.997 Doctoral Reading

* Material approved by the candidate's adviser. (Only S or F grades will be assigned for this course.) *Prep. Passing of Ph.D. Qualifying Exam.*

3.998 Special Problems in Electrical Engineering

Theoretical or experimental work under individual faculty supervision. *Prep. Consent of dept. chairman.*

CHEMICAL ENGINEERING

Prerequisite courses and advanced undergraduate courses will not be given credit unless approved by an academic adviser. Approval must be made on a graduate engineering petition form and submitted to the Graduate Engineering office. All chemical engineering courses and courses from other departments that are of an advanced undergraduate or

prerequisite level are indicated by an asterisk () and apply to the academic adviser approval regulation.*

4.801 Advanced Chemical Engineering Calculations (4 q.h. credits)

Fundamental process principles leading to an understanding of the stoichiometric principles of chemical process plants. The study of complex material and energy balances is undertaken with the view to apply these principles to actual large chemical plant conditions. *Prep. Bachelor of Science degree in Chemical Engineering, including differential equations.*

4.802 Chemical Engineering Mathematics (4 q.h. credits)

Formulation and solution of problems involving advanced calculus as they arise in chemical engineering situations. Methods covered will include ordinary differential equations, series solutions, complex variables, Laplace transforms, partial differential equations, and matrix operations. Emphasis will be placed on methods for formulating the problems. It will be assumed that the student has been exposed to some of these topics in appropriate mathematics courses. *Prep. Bachelor of Science degree in Chemical Engineering, including Mathematical Analysis.*

4.803 Numerical Techniques in Chemical Engineering (4 q.h. credits)

Digital computer applications to chemical engineering problems. Topics covered include location of roots of linear and nonlinear equations, numerical integration, and curve-fitting techniques with emphasis on the numerical solution of ordinary and partial differential equations and to the subject of linear algebra. *Prep. Bachelor of Science degree in Chemical Engineering.*

4.806 Optimization Techniques (4 q.h. credits)

Several mathematical optimization techniques are developed and applied to chemical engineering problems. Emphasis on a thorough understanding of a single, representative technique selected from among many within its class. Topics include single variable search (Fibonacci Search), multidimensional search (Pattern Search), linear systems (Linear Programming) and sequential operations (Dynamic Programming). *Prep. Bachelor of Science degree in Chemical Engineering.*

4.811 Chemical Engineering Thermodynamics (4 q.h. credits)

Classical thermodynamics as a method of approach to the analysis of processes of interest to chemical engineers. A study of chemical and phase equilibria involving the various states of matter; prediction and correlation of physical, chemical, and transport properties of gases and liquids; elementary concepts of quantum and statistical mechanics to interpret the empirical properties of classical thermodynamics. Fundamental principles are reviewed to the extent needed. *Prep. Bachelor of Science in Chemical Engineering.*

4.812 Chemical Equilibria

This course embodies those elements of 4.811 which are concerned with the thermodynamics of chemical equilibria. Topics covered include auxiliary functions, the conditions of equilibrium, equilibrium of reactions involving gases, and the phase rule as applied to heterogeneous reaction systems. *Prep. Graduate Standing in Chemical Engineering.*

4.821 Corrosion Fundamentals

Economic factors, basic theories, types, behaviors of specific systems, and protection against corrosion are studied. Wherever possible, engineering applications of the principles are emphasized. *Prep. Bachelor of Science degree.*

4.823 Transport Phenomena

Momentum rate conservation equations for steady-state fluid flow in two-dimensional boundary layers are presented and solved to obtain the fluid velocity profiles. These results are utilized in the consideration of heat and mass transfer phenomena at a fluid-solid interface. The development of surface renewal theory is presented and applied to the description of heat and mass transfer phenomena. *Prep. Bachelor of Science in Chemical Engineering.*

4.824 Transport Processes

A consideration of the relationships of mass, momentum, and energy transport. Fundamental equations of change for these types of transport are derived and solved for various chemical and physical systems. *Prep. Advanced Mathematics or undergraduate Transport Phenomena or permission.*

4.827 Chemical Process Control I

Review of classical control techniques; state variable representation and analysis of continuous systems with process dynamics and control applications in chemical engineering. *Prep. Graduate Standing in Chemical Engineering.*

4.828 Chemical Process Control II

Continuation of 4.827 to include multivariable control problems in chemical engineering with associated problems from the chemical engineering literature. *Prep. 4.827.*

4.829 Chemical Process Control (4 q.h. credits)

Review of time, Laplace, and frequency domain process dynamics and control. State variable representation and analysis of continuous systems with applications in chemical engineering. Multivariable control problems. Digital simulation of control systems. *Prep. Graduate standing in Chemical Engineering or permission.*

4.830 Computer Process Control (4 q.h. credits)

Computer control hardware and software. Z-transform, pulse transfer functions, and data holds. Open and closed-loop response and design of sampled-data systems. Computer control algorithms. Digital simulation of sampled-data systems. *Prep. Graduate standing in Chemical Engineering or permission.*

4.832 Chemical Data Estimation

Methods of obtaining physical and thermodynamic properties of chemical compounds and systems without resorting to laboratory investigation. Latest empirical relationships and physical and thermodynamic laws are introduced to obtain data for plant design and other chemical and engineering uses. *Prep. Bachelor of Science degree.*

4.833 Research Techniques I (4 q.h. credits)

The essential techniques of research including experimentation, mathematical modeling, data reduction, and graphical presentation techniques. For students in the non-research

options (M.S. and D.Eng.). *Prep. Bachelor of Science degree and registration in non-thesis M.S. or D.Eng. program in Chemical Engineering.*

4.834 Research Techniques II (4 q.h. credits)

Continuation of 4.833. *Prep. 4.833.*

4.835 Analytical and Numerical Techniques (4 q.h. credits)

For students interested in solving comprehensive problems using computer methods. Problems solved in the course will be based on the interest of the students and staff and will be individual. *Prep. Bachelor of Science degree and knowledge of digital computer programming.*

4.837 Modeling and Simulation of Chemical Process (4 q.h. credits)

This course includes the material given in 4.838. In addition, use of chemical process simulation programs, optimal heat exchanger networks, and additional articles from the literature are treated. *Prep. Graduate standing in Chemical Engineering.*

4.838 Modeling and Simulation of Chemical Processes

Algorithms for structuring steady-state design calculations. Tearing recycle streams for iteration on minimum streams and minimum parameters. Convergence acceleration for calculations involving recycle streams. Algorithms for design variable selection. *Prep. Graduate standing in Chemical Engineering or permission.*

4.840 Advanced Management Techniques in the Chemical Industry (4 q.h. credits)

Management techniques applied to the chemical industry. Special attention to management of research organizations and to management of engineering services, such as design, computer, and related activities. *Prep. Graduate standing.*

4.845 Advanced Plant Design Concepts (4 q.h. credits)

Modern approaches to plant design; computer-oriented design, analysis and simulation of chemical processes, use of strategy decision making in design, advanced scheduling and planning techniques. *Prep. Bachelor of Science in Chemical Engineering.*

4.850 Chemical Process Pollution Control (Water) (4 q.h. credits)

Provides chemical engineering students with basic fundamentals for handling environmental problems in the chemical process industries. Water quality requirements and industrial waste characteristics; wastewater treatment processes applicable to environmental engineering; biological treatment processes and equipment; comprehensive design problems involving biological and tertiary treatment; the economics of water treatment and reuse. *Prep. Graduate standing in Chemical Engineering.*

4.855 Wastewater Treatment Technology

Industrial waste treatment technology for various specific contaminants found in industrial wastes with emphasis on the chemical process industries. Information on sources and levels of contaminants, existing methods of treatment, levels of treatment attainable, and associated costs. *Prep. Graduate standing in Chemical Engineering.*

4.861 Fuel to Fuel Conversion

Energy problems associated with the oil, gas, and coal industries. The relative merits of various processes for converting one fuel to another, including the gasification of coal

to produce either a low-BTU gas or pipeline quality gas. Production of oil from oil shale, coal, and tar sands. *Prep. Bachelor of Science degree.*

4.862 Solar Energy Thermal Processes

Covers fundamental thermal processes involved in obtaining useful heat from flat-plate solar collectors. The components required in an active solar energy collection system are analyzed and the economics of the system are considered. *Prep. Bachelor of Science degree.*

4.870 Polymer Science (4 q.h. credits)

Basic concepts of polymers, thermodynamics of polymer solutions and measurement of molecular weight. Physical and chemical testing of polymers. Crystallinity in polymers and rheology of polymers. Physical and chemical properties of polymers. Mechanisms and conditions for polymerization of polymers including step-reaction, addition and copolymerization. Discussion of carbon-chain polymers, fibers and fiber technology. *Prep. Bachelor of Science degree in Chemical Engineering or Chemistry.*

4.871 Fundamentals of Polymer Processing (4 q.h. credits)

Transport properties of polymer solutions and polymer melts. Modeling and design of polymer processing equipment. Flow models for processes involving heat, mass, and/or momentum transfer. Analysis of flow stability and elastic phenomena. Applications to the design of equipment for extrusion, calendering, coating, fiber spinning, tubular film blowing, injection molding and mixing. *Prep. B.S. in Engineering.*

4.872 Principles of Polymerization (4 q.h. credits)

Introduction to polymers and polymer properties. Mechanisms of polymerization including step polymerization, radical-chain polymerization, emulsion polymerization, ionic-chain polymerization, chain copolymerization and ring-opening polymerization. Stereo chemistry of polymerization and synthetic reactions of polymers. Applications to reactor design of industrially important polymers. *Prep. B.S. in Chemistry or Chemical Engineering.*

4.890 Heterogeneous Catalysis (4 q.h. credits)

Experimental methods required for determining the surface area and pore structure of catalyst carriers are discussed. These structural characteristics are utilized to estimate mass and heat transport rates within porous catalysts in order to determine their effectiveness with respect to chemical reaction. Mechanisms for chemical poisoning of catalysts are also analyzed. Reactions of practical interest are used to illustrate the applications of heterogeneous catalysis to modern chemical processing problems. *Prep. Bachelor of Science degree in Chemical Engineering.*

4.891 Kinetics of Chemical Processes

The theoretical foundations required for the analysis of elementary chemical reaction rates, such as collision theory, particle dynamics, and transition state theory are presented. Consideration is given to the theory of monomolecular reactions and the effect of solvent and electrostatic forces on liquid phase reaction rates. Homogeneous catalysis and selected free-energy correlations are covered. *Prep. Bachelor of Science degree in Chemical Engineering.*

4.899 Special Topics in Chemical Engineering (4 q.h. credits)

Topics of interest to the staff member conducting this class are presented for advanced study. A student may not take more than one Special Topics course with any one instructor. *Prep. Permission of department staff.*

4.973 Chemical Process Heat Transfer (4 q.h. credits)

Empirical methods and calculations used to design heat transfer equipment for the chemical process industries. Review of basic heat transfer principles. Shell-and-tube calculations for liquid and/or vapor phase heat transfer. Direct contact and other special heat exchanger applications. *Prep. Bachelor of Science in Chemical Engineering.*

4.974 Selected Topics in Fluid Mechanics (4 q.h. credits)

Discussion of statics, kinematics, and stress concepts associated with fluids. Formulation of the general equations of motion with application to laminar and turbulent flow. Topics on boundary layer theory and compressible flow are included. *Prep. Bachelor of Science in Chemical Engineering.*

4.978 Separation Processes (4 q.h. credits)

Calculation and design methods used in processes involving mass transfer. Topics covered include vapor liquid equilibria for binary and multicomponent systems, multicomponent distillation, absorption and extraction. Emphasis is placed on methods and techniques which are common to many separation processes. *Prep. B.S. degree in Chemical Engineering.*

4.990 Seminar

Topics of an advanced nature are presented by staff, outside speakers, and students in the graduate program. This course must be attended by all master's degree candidates. *Prep. Admission to graduate program in Chemical Engineering.*

4.991 Thesis (Master's Degree)

Analytical and/or experimental work conducted under the supervision of the department. For master's degree requirement. *Prep. Admission to Master of Science program in Chemical Engineering.*

4.995 Thesis (Ph.D. Degree)

Theoretical and experimental work conducted under the supervision of the department. *Prep. Admission to doctoral program in Chemical Engineering.*

4.996 Thesis (D. Eng. Degree)

Theoretical and experimental work conducted under the supervision of the department. *Prep. Admission to doctoral program in Chemical Engineering.*

INDUSTRIAL ENGINEERING, ENGINEERING MANAGEMENT, AND INFORMATION SYSTEMS

Prerequisite courses and advanced undergraduate courses will not be given credit unless approved by an academic adviser. Approval must be made on a graduate engineering petition form and submitted to the Graduate Engineering office. A maximum of six quarter hours of credit at this level may be applied toward a Master's degree. The industrial engineering courses listed below and courses from other departments that are of an advanced undergraduate or prerequisite level are indicated by an asterisk (*) and apply to the six quarter hour maximum regulation.

5.801 Analysis of the Industrial Enterprise I

Introduction to business organization, management and operation. Business responsibility to employees, its product, the customer and to the environment in which it operates. What faces the industrial enterprise in its effort to become profitable.

5.802 Analysis of the Industrial Enterprise II

A survey of modern planning, forecasting and budgeting. The financial markets; investing, speculating. Economic growth and controls. The interaction of politics, government and government controls on the industrial enterprise. Concerns of the engineering manager with these topics. *Prep. 5.801, Analysis of the Industrial Enterprise I.*

5.803 Industrial Organizations

An analysis of the purpose and functioning of organizations as the basic networks for achievement of goals through coordination of effort, communication, and responsibility. The approach will emphasize the role and function of engineering in organizations and will be based on modern behavioral science concepts. *Prep. Admission to program.*

5.805 Industrial Budgeting for Engineers

Budgeting plans, programs, and reports for industry today; an introduction to the essentials of fixed and variable budgeting for production, inventory, sales, cash, capital, and cost-volume-profit analysis. *Prep. 5.810, Industrial Accounting for Engineers or equivalent.*
Offered alternate years with 5.811.

5.806 Production Forecasting

Econometric methods of forecasting the demand for industrial products; emphasis on techniques applicable to individual companies and the total demand. The principal tool used is the mathematical model of the causal factors with special attention to determining the reliability of the model. *Prep. 5.963, Statistics or equivalent.*

*5.808 Basic Engineering Economy

Economic analysis in formulating business policies and selecting alternatives from possible engineering solutions to industrial problems, present worth, annual cost, and rate of return techniques using discrete compound interest calculations. *Prep. Bachelor of Science degree in Engineering or Science.*

* Prerequisite course.

5.809 Advanced Engineering Economy

Principal emphasis on the practical application of the techniques studied in basic engineering economy; problems of implementation through class discussion of cases and student project; recent advances in the techniques of engineering economy, especially those relating to the consideration of uncertainties. *Prep. 5.808, Basic Engineering Economy or equivalent.*

***5.810 Industrial Accounting for Engineers**

Introduction of basic accounting principles and procedures; use of accounting data as a management tool; a practical covering of basic cost accounting procedures related to materials, labor, and manufacturing expense cost control; job order, process, and standard cost systems. *Prep. Bachelor of Science degree in Engineering or Science.* Offered alternate years with 5.805.

5.811 Cost Accounting for Engineers

Cost accounting procedures as established by accountants are studied and evaluated in terms of being considered by the engineer for cost determination of alternative engineering proposals. *Prep. 5.810, Industrial Accounting for Engineers or equivalent.*

5.812 Managing Professional Personnel

The science and art of managing creative people employed in research, developmental, and engineering activities are considered with a view to understanding the problems encountered by such people and their managers in the course of their professional work. Attention is devoted to some behavioral theories and their applications in the practice of management. Emphasis is placed on each student's own experiences as professionals or managers in diverse industrial settings. Interactive considerations of problems encountered by the students on their jobs provide case studies for analysis by the class and bases for further insights to the practices of managing professionals in several fields of endeavor. *Prep. Bachelor of Science degree in Engineering or Science.*

5.813 Engineering Communication

Exploration of practice in the effective preparation and presentation, both written and oral, of the results of engineering projects and programs as a basis for business decisions: including formal reports, progress summaries, memoranda, and technical papers. The effective use of various media and audiovisual aids based on both audience and material. *Prep. Bachelor of Science degree in Engineering or Science.*

5.814 Development of Engineering Managers

Analysis of the problems faced by the engineer in the transition from individual contributor to engineering manager; the challenge of engineering management; integrating professional and management objectives; developing guides for engineering managers to examine their own work and performance and to improve their effectiveness as well as develop managerial skills in their subordinates. *Prep. 5.801, Analysis of the Industrial Enterprise I.*

5.816 Industrial Psychology for Engineers

A general coverage of the application of psychology to industry with emphasis on industrial environments and organization, human relations, group dynamics, tests and measurements, personnel practices, training, and motivation. *Prep. Bachelor of Science degree in Engineering or Science.*

5.817 Advanced Work Design

Basic philosophies of work design; implementation of work design concepts with case studies; study and analysis of models such as work sampling, sequence or flow of work models; repetitive and nonrepetitive work models, and work measurement models such as standard data; human factors in measuring operator performance; regression analysis approaches; emphasis on development of professional, analytical, and managerial skills and abilities at a systems level. *Prep. Bachelor of Science degree in Engineering or Science.*

5.819 Human Factors — Sensory/Motor

Design of equipment and systems for human use; emphasis on the application of engineering psychology; visual and auditory presentation of information — human information processing and skilled task performance — compatibility and equipment design. *Prep. 5.851, Introduction to Human Factors Engineering or equivalent.*

5.820 Personnel Administration for Engineers

Personnel programs for attracting and retaining technical talent; evaluating effectiveness of major personnel policies including relations with organized labor; modern methods of salary and wage administration; planning profitable relationships among company, supervisors, and employees. *Prep. Bachelor of Science degree in Engineering or Science.*

5.822 Product Design and Value Analysis

Study of design parameters and their effect on development, manufacturing and procurement; functional analysis of components and systems; complete projects and case studies are integrated in the course. *Prep. Bachelor of Science degree in Engineering or Science.*

5.823 Production Analysis (4 q.h. credits)

Study of advanced problem-solving techniques in the areas of method and measurement, layout and facilities planning, material handling and manufacturing process. Case studies and a course project in a local concern illustrate the concepts presented. *Prep. Bachelor of Science degree in Engineering or Science.*

5.824 Case Studies in Industrial Engineering

Formulation of problems and analysis of situations on topics such as: work measurement, line balancing, plant layout, regression analysis, wage and salary administration, management information systems and network analysis. Class discussion and written analysis of a variety of cases is included. *Prep. 5.823, Production Analysis.*

5.830 Financial Management I

Study of the issues and processes of short-term financing of industrial firms; financial analysis of cases, supplemented by readings to develop familiarity with sources and uses of working capital as well as the goals and problems involved in its management. (Open to Engineering Management majors only.) *Prep. 5.801, Analysis of the Industrial Enterprise I, and 5.810, Industrial Accounting for Engineers, and 5.808, Basic Engineering Economy or equivalent.*

5.831 Financial Management II

Extension of Financial Management I with emphasis on analysis necessary to such long-term financial decisions as issuance of stock or bonds; contracting of leases or loans,

and financing of a new enterprise; mergers, capital budgeting, the cost of capital, and the valuation of a business. *Prep. 5.830, Financial Management I.*

5.841 Engineering Project Management

Principles and practices of managing engineering projects in the complex environment of rapid technological advance, stiff competition, adverse economic conditions, ever-changing governmental regulations, and the constraints of corporate operating policies are considered with a view to acquiring deeper insights to achieving personal and company objectives while meeting contractual commitments. Particular emphasis is placed on planning the effort, organizing and integrating resources, measuring results, understanding proposal requests, writing winning proposals, understanding and meeting contractual requirements, negotiating contracts and changes therein, developing personnel as well as fulfilling entrepreneurial goals. *Prep. 5.812, Managing Professional Personnel, or 5.814, Development of Engineering Managers, or department permission.*

5.851 Introduction to Human Factors Engineering

A survey of the principal topics and areas of concentration in the field. Includes introductory concepts of sensory physiology and sensory performance; basic motor capabilities and limitations; concepts of the human as a processor of information; and methods of gathering human performance data. Normally the first course in the human factors area for students without behavioral science background. *Prep. Statistics II or permission of instructor.*

5.852 Human Factors — Work and Environment

Focuses upon the human as a work-performing, heat-generating physiological engine. Examines the implied restrictions upon equipment and work place to provide occupational safety and effective man/machine performance. *Prep. 5.851, Introduction to Human Factors Engineering or equivalent.*

5.853 Man-Computer Interaction

Design and evaluation of the man-computer interface in on-line information systems: formatting of visual displays and auditory outputs, techniques to facilitate operator inputs, pacing and control of the interactive sequence, operator training, task analysis and performance testing. Student projects in areas of novel application. *Prep. 5.819, Human Factors, — Sensory/Motor.*

5.854 Human Factors Engineering — Data Base

The study of methods and techniques used to obtain and interpret human performance data. Includes examination of experimental methods and problems peculiar to experimentation with human subjects; unobtrusive measures, and non-reactive techniques, survey design and implementation, and systematic observation techniques. *Prep. 5.964, Design of Experiments I.*

5.855 Human Factors Engineering — Application Methods

Systems analysis and man/machine systems; function and task analysis, task allocation, support equipment and training design, error analysis. Occupational safety; preconstruction, periodic; and accident/critical incident analytic techniques. *Prep. 5.851, Introduction to Human Factors Engineering or equivalent.*

5.862 Introduction to Occupational Health and Safety

Accident prevention, accident cost analysis, Federal and local legislation, record keeping requirements under OSHA Act of 1970; occupational safety and health standards, safety

programs and inspections, fire prevention and control methods; human behavior and industrial safety, occupational diseases and personnel protective equipment.
Prep. Bachelor of Science degree in Engineering or Science.

5.863 Technical Aspects of Health and Safety

Safety responsibilities of management and employees; methods of hazard control; accident investigation; recognition of chemical, electrical and mechanical hazards; principles of machine guarding; occupational safety and health standards, safety training; toxicology and first aid and medical services. *Prep. 5.862, Introduction to Occupational Health and Safety or permission of the instructor.*

5.864 Topics in Physiology and Biomedical Engineering

Introduction to specific areas relating to human structure and function, and to the use of engineering techniques for medical diagnosis and therapy. Areas considered include blood and blood components, the cardiovascular system, the kidney and urinary systems and respiratory systems. The course will be taught on a seminar basis. Students will be required to do literature research under the guidance of the instructor. *Prep. Permission of instructor.*

***5.900 Basic Operations Research (4 q.h. credits)**

An introduction to the theory and use of deterministic and stochastic models to represent industrial operations. Models included are those of linear programming, dynamic programming, inventory control, waiting lines, and Monte Carlo simulation. Embodies the material in 5.901 and 5.902, Basic Operations Research I and II. Open to both day and evening students. *Prep. 5.962, Statistics I or 10.8G1, Probability.*

***5.901 Basic Operations Research I**

Introduction to the theory and use of deterministic models to represent industrial operations; includes linear programming, dynamic programming, networks, and game theory. *Prep. Bachelor of Science degree in Engineering or Science.*

***5.902 Basic Operations Research II**

Introduction to the theory and use of stochastic models to represent industrial operations; includes queuing, inventory, and Markovian models. *Prep. 5.901, Basic Operations Research I and 5.962, Statistics I or equivalent.*

5.903 Inventory Control and Production Planning

The design and operation of inventory systems from a scientific management point of view, including both required theory and practical aspects. Subjects include inventory control models, statistical forecasting, production scheduling techniques, distribution systems, management control and reports, discussion of actual systems, and a case study. *Prep. 5.963, Statistics II or equivalent.*

5.904 Queuing Theory and Its Applications

A development of the theory of queues with emphasis on practical applications, using the latest techniques of Markovian state-transition diagrams to simplify the mathematic

* Prerequisite course.

model; study of models based on random arrivals and departures including exponential and Erlang service distributions, single and multiple services, series and parallel systems, finite and infinite queues; applications to staffing, inventory control, reliability, maintenance and scheduling. *Prep.* 5.900 or 5.902, *Basic Operations Research II*.

5.905 Analysis with Simulation

Appropriate utilization of simulation as an effective quantitative analysis technique. Course covers when, where, and how to use discrete event simulation techniques. Topics include model design, development and validation, as well as tactical and strategic planning considerations in the use of the model to evaluate alternatives. Several special purpose simulation languages are discussed with emphasis and practical exercise using GPSS. Applications are drawn from both production and service industry settings. *Prep.* 5.913, *Data Processing for Engineers*, 5.962 *Statistics I (formerly Probability and Statistics III)*, or equivalent.

5.906 Principles of Dynamic Systems I

Introduction to modeling of social systems, emphasizing the study of feedback structures and their behavior; development of concepts that allow one to understand the mechanisms underlying growth, stagnation and cyclical fluctuation; examples and practice at formulating models of industrial, economic, social, and ecological systems; study of some of the effects of delays, multiple feedback loops, and nonlinearities; aim to building an intuitive foundation for simulation studies of complex systems. *Prep.* *Bachelor of Science degree in Engineering or Science*.

5.907 Principles of Dynamic Systems II

Continuation of topics from 5.906 with increased experience in the construction and analysis of generic feedback structures; examination of current and previous System Dynamics applications including Urban Dynamics and World Dynamics; exercises in model conceptualization. *Prep.* 5.906, *Principles of Dynamic Systems I*.

5.909 Systems Engineering and Analysis

Principles of systems modeling using a transfer function approach; transient response and sensitivity of open and closed-loop systems; stability analysis; frequency response. Emphasis is on the most recent time-domain analysis methods using state-transition diagrams, and solving by computer using readily available computer algorithms. *Prep.* 5.913, *Data Processing for Engineers*.

5.911 Linear Programming

An in-depth development of the theory in formulating the linear programming model for solving the problems of resources allocation, blending of ingredients, cutting stock, and flow-network commonly found in industry; sensitivity analysis, duality theorem, fundamentals of integer programming. *Prep.* 5.900 or 5.902, *Basic Operations Research II* or equivalent and a course in linear algebra.

5.912 Network Planning and Control

Applications of stochastic networks to project management, scheduling, inventory, reliability, quality-control and other industrial applications; review of PERT and its inadequacies, to the development of stochastic flow-graphs and networks; solving for the mean task times and variances using moment-generating functions; setting up the model for computer simulation using GERT. *Prep.* 5.962, *Statistics I (formerly Probability and Statistics III)*.

***5.913 Data Processing for Engineers**

Open only to students who have not had a basic course or extensive experience in a compiler language. A study of digital computers and computer programming techniques as applied to management problems. The course will cover the basic characteristics and operation of computing equipment and peripheral devices. The FORTRAN language is presented in depth and will be utilized by the student for programming and running several projects on a computer. Other compiler languages will be described and compared to FORTRAN. A systems approach to the design, development, and implementation of computer programs for solving management problems will be emphasized. Examples will be studied from several management areas. *Prep. Bachelor of Science degree in Engineering or Science.*

5.914 Advanced Operations Research (4 q.h. credits)

Further study of quantitative techniques available to assist management in scientific decision-making, including Markov processes, utility theory, Bayesian statistics, and forecasting; case studies of real industrial problems. *Prep. 5.900, Basic Operations Research.*

5.916 Engineering Analysis Utilizing Data Processing

Application of computers and major high-level computer languages to the solution of engineering problems. FORTRAN and GPSS are employed in applications drawn from production and service-oriented industries to illustrate topics such as generation of random numbers, inventory simulation models, file search and sorting techniques, and root-finding algorithms. The standard software packages of SPSS and MPOS are introduced. *Prep. 5.913, Data Processing for Engineers, or equivalent.*

5.918 Applied Topics in Operations Research

Selected applications from the material covered in 5.901 and 5.902. *Prep. 5.901 and 5.902, Basic Operations Research I and II.*

5.919 Independent Study in Operations Research

Special topics in Operations Research by arrangement with a faculty member.

5.920 Elements of Structured Programming

An introductory course to the principles and techniques of top down structured programming. The host language is PASCAL and topics covered include assignment statements, logical expressions, control statements, data structures, recursion and pointers.

5.930 Basic Computer Systems Technology

Introduction to computer systems and assembly language programming using a language such as MIX. Topics include: machine language, assemblers and compilers. Input/output device control. List processing, searching, and sorting; file systems and storage management. Students are required to prepare and test several programs. The emphasis is on basic concepts necessary to understand and evaluate technological development. *Prep. 5.913, Data Processing for Engineers.*

* Prerequisite course.

5.931 Compiler Design I

An introduction to data structures including stacks and trees. The nature of compiling and interpreting, string manipulation and code generation. The writing of a compiler in assembly language of a BASIC-like source language will be started. *Prep. 5.930, Basic Computer Systems Technology, or consent of instructor.*

5.932 Compiler Design II

The Compiler design work started in 5.931 is completed as a term project. *Prep. 5.931, Compiler Design I.*

5.933 Data Structures for Information Systems

Treats the topics of computer files, file organization and processing, list and tree organization, maintenance controls, for quality, protection and security. *Prep. 5.940, Basic Information System Technology.*

5.934 Data Base Management

Introduction to data base systems and their rise in corporations. Review of basic data storage concepts. Evolution and growth of data bases. Data organization, file creation and management using hashing, threaded lists, tree structures. Distributed data bases. Data base software, directory maintenance, types of data base languages, query languages. Data base management systems. Data base administration. *Prep. 5.933, Data Structures for Information Systems, or equivalent.*

5.936 Simulation Methodology

Consideration of concepts in modeling, input data reduction, alternative programming languages for implementing models, model validation, efficiency in running simulations, and statistical reliability in the design and analysis of simulation experiments. Topics covered include: alternative approaches for simulation model control and their associated programming languages (e.g. SIMSCRIPT, GASP, and GPSS); parametric and nonparametric statistical techniques for reduction of empirical data to appropriate form for model input and validation; tactical planning issues such as selection of initial conditions, variance reduction techniques, and efficient generation of random variates; and design and analysis of experiments with underlying assumptions appropriate to the simulation process. Computer exercises illustrating the theoretical concepts will be drawn from production and service-oriented industries. *Prep. 5.905, Analysis with Simulation.*

5.938 File Processing

Processing of sequential, indexed-sequential, and direct/relative data files on tape and disk; record blocking, searching, sorting, and merging operations; random access techniques; introduction to data base management concepts, and if time permits an introduction to RPG. *Prep. 5.939 or ability to program in COBOL.*

5.939 Principles of COBOL

Fundamentals of computer programming in COBOL. Topics include elementary computer functioning, program organization, input/output operations, arithmetic and data-handling verbs, and program logic development through the use of flow charts. Storage and manipulation of large data files on magnetic tape are introduced. No prior computer experience is required.

5.940 Basic Information System Technology

Introduction to the hardware and software which support computer-based management information systems, design, development, and operation. Topics include basic computer concepts such as binary number systems, and CPU instruction cycle; data conversion and data entry devices; secondary memory types; output and display devices; and the nature of machine-oriented and high-level computer languages. Objective of the course is to provide sufficient knowledge regarding these concepts and equipment characteristics to permit specification of software and equipment configuration appropriate to support a given set of management information needs. *Prep. Bachelor of Science degree in Engineering or Science.*

5.941 Management Information Systems

The development of a conceptual framework which emphasizes support to management decision making. Relevant cognitive and organizational characteristics of human decision making are integrated into a systems analysis approach to development of effective information systems. Case study discussions are used extensively to apply principles to realistic situations. *Prep. Bachelor of Science degree in Engineering or Science.*

5.942 MIS: Planning, Control and Development

Phases of MIS design and development are examined from a planning and control viewpoint. Techniques are presented for conceptual identification of a continuing stream of information system candidate projects, for achieving a user-oriented assessment of cost/benefit potential, and for control of the design and implementation effort. Case study discussions are used extensively to apply principles to realistic situations. *Prep. Bachelor of Science degree in Engineering or Science.*

5.943 Distributed Data Processing

Develops the trade-offs in performance between centralized systems utilizing large-scale hardware installations and distributed systems utilizing minicomputers. Trade-offs are in terms of MIS performance capabilities, software development costs and lead times, management control, documentation and maintenance times and cost. Discussion of hardware is at the conceptual level of data flow and processing performance. *Prep. 5.940, Basic Information System Technology.*

5.944 Computerized Financial Control Systems

Considers on-line systems for financial and inventory control from the technological, legal, and social point of view. The focus of the course is on electronic funds transfer (EFT) and point of sale (POS) terminals and associated computing equipment for inter-bank and consumer banking transactions, debit card transactions, and retail management information systems to control cash and inventory. The current technological status of EFT and POS terminals is discussed, including computing equipment and data communications systems, system development time and cost, and data base security precautions. A significant portion of the course attempts to establish a prognosis for the use of EFT and POS terminals by assessing the opinions of principal figures and organizations in banking and retail, sometimes using guest lecturers. *Prep. 5.940, Basic Information System Technology.*

5.945, 5.946 Operating Systems and System Software I and II (2 courses, 2 quarter hours each)

A study of the components of operating systems including resource allocation management, multitasking, scheduling and I/O. Major software elements of a computer system

are considered, including loaders, linkers, assemblers, compilers and interpreters. *Prep.* Knowledge of assembly language; 5.933, *Data Structures for Information Systems*; 3.972, *Digital Computer Design I-A*.

5.947 Principles of Software Design

Examines techniques for solving complex computer programming tasks with special attention to the technological and organizational factors affecting information system building. Topics include run-time structures in programming languages, communication, linking, and sharing of programs and data; also, interface design, program documentation, maintenance modification, testing and debugging. Current topics in program design such as readability, data abstraction, step-wise refinement and structured program are also covered. *Prep.* 5.945 and 5.946, *Operating Systems and System Software I and II*.

5.948 Information Systems and Society

Discussion of the role computer systems play in modern society. The beneficial use of computers in commercial and industrial enterprises is considered and contrasted with the potential for infringement of individual privacy rights. Sufficient technical material on computer hardware, software, and data communications is discussed to permit assessment of system feasibility. Relevant major legislation is related to current practice in use of computer systems.

5.953 Statistical Decision Theory

Use of Bayesian statistical inference to arrive at decisions when stochastic variables are interacting; relationship to game theory; decision making over time in a sequence; important expected values and distributions; relationship of Bayesian decision theory to classical statistical inference. *Prep.* 5.962, *Statistics I (formerly Probability and Statistics III)*, or equivalent.

5.954 Advanced Quality Control

Mathematical methods of quality control; development of the process control charts for sampling by variables and by attributes; development of acceptance test procedures; development of life-testing plans; cost aspects of quality-control decisions. *Prep.* 5.962, *Statistics I*.

5.955 Reliability Theory in Design

An introduction to the mathematical theory of the reliability of non-maintained systems and their application in the design of hardware and equipments in general; application of active and standby redundancy in systems; reliability predictions; stress-denoting techniques; availability concepts; design reviews and managerial control. *Prep.* 5.962, *Statistics I*.

5.956 Reliability and Maintainability Assessment

Engineering graphical and mathematical methods for reducing reliability test and field data; development and application of reliability and maintainability demonstration test plans and the economic aspects of each plan; maintainability predictions; managerial decisions. *Prep.* 5.962, *Statistics I*.

5.957 Reliability Analysis of Complex Systems

A Markovian-chain state-transition diagram approach to reliability modeling of non-maintained and maintained systems which permits analytic steady-state and dynamic solutions

of both the stationary and non-stationary models; setting up the matrix-equations for solution by computer; controlling the numerical oscillations and accuracy of the results.
Prep. 5.955, Reliability Theory in Design.

***5.960 Probability I**

Fundamental concepts of probability. Events, event space, sample space, sampling. Axiomatic development events and the algebra of events. Counting, permutations, combinations. Discrete and continuous random variables. Density functions, mass functions, cumulative probability distributions. Expectation of random variables. Common discrete and continuous probability distributions including binomial, poisson, geometric, uniform, exponential and normal. *Prep. Admission to program.*

***5.961 Probability II**

Continuation of 5.960. Multivariate probability distributions, marginal and conditional distribution. Expected value of functions of random variables, variance, covariance, and independence of random variables. Common multivariate distributions including the multinomial and the multivariate normal. Methods of determining the probability distributions of functions of random variables are discussed. *Prep. 5.960, Probability I.*

***5.962 Statistics I**

Basic tools of statistical inference are covered. Limit theorems to include central limit, Chebyshev's Inequality, law of large numbers, point and interval estimators. Properties of estimators — bias, sufficiency, variance. Estimation by moments, max likelihood, Bayes. Hypothesis and hypothesis testing. One- and two-sided tests. Type I and Type II error. Power curve. *Prep. 5.961, Probability II.*

5.963 Statistics II

Extensions of topics covered in 5.962 to develop more complete statistical models for prediction and analysis of random phenomena. Topics include multiple regression analysis, correlation, design and analysis of simple experiments, and nonparametric tests such as goodness of fit and contingency tables. *Prep. 5.962, Statistics I.*

5.964 Design of Experiments I

An introduction to the theory and application of experimental design techniques such as modeling and statistics can optimize resources and improve decision making risks. This course will cover experiments with single and multiple factors of interest and consider restrictions imposed by various experimental conditions. *Prep. 5.962, Statistics I.*

5.965 Design of Experiments II

A continuation of topics from 5.964 including further design techniques to handle experiments with higher order experimental restrictions. Some additional analyses techniques will also be covered. *Prep. 5.964, Design of Experiments I, or equivalent.*

*** 5.966 Probability and Statistics (4 q.h. credits)**

Same material as 5.960 and 5.961 but offered as a 4 q.h. course.

** Prerequisite course.*

5.991 Thesis (Master's Degree) (6 q.h. credits)

Analytical and/or experimental work conducted under the auspices of the department.

Prep. Consent of adviser.

5.992 Seminar in Industrial Engineering

Discussion and presentations of thesis related topics by students, presentations and discussions by faculty and eminent people in the field on timely industrial engineering topics. Field trips and visitations included where appropriate.

5.993 Special Project in Industrial Engineering (2 or 4 q.h. credits)

Individual work under faculty supervision. *Prep. Consent of adviser.*

5.994 Industrial Engineer Degree Project (10 q.h. credits)

Undertaken with the approval of the candidate's adviser and the Department Graduate Committee.

INTERDISCIPLINARY COURSES

BIOMEDICAL

93.901 Engineering and Medicine I

The intersection of technology with medicine; historical development of bioengineering profession; its impact on society; study of activities embraced by the profession today; educational, training, and career opportunities in clinical, biomedical, and medical engineering for individuals at the BS, MS, and Ph.D. levels; future goals of engineering in biology and medicine; and issues basic to the relationship between new medical technology and the efficiency and effectiveness of the health care system. *Prep. Bachelor of Science in Engineering or allied field.*

93.911 Biomedical Applications of Heat and Mass Transfer

Bioheat equation; thermal transport in living systems, thermal properties; thermal techniques in the measurement of blood flow; applications of heat transfer in medicine including hyperthermia for cancer therapy, hypothermia for tissue and organ preservation and cryosurgery, thermal sources for implantable artificial heart; and thermography in cancer detection. *Prep. Bachelor of Science in Engineering or allied field.*

93.912 Selected Topics in Bioengineering

Study of biomedical engineering appropriate to topics selected from fields of biomaterials, nuclear medicine, radiation diagnosis and therapy, biological transport processes, artificial organs, rehabilitation engineering, and microprocessor based clinical instruments. Introduction to medical technology assessment. *Prep. 93.901 or permission of instructor.*

TRANSPORTATION

93.818 Special Topics of Transportation (2 q.h. credits)

An individual effort in an area selected by student and adviser resulting in a definitive report. *Prep. Permission of the Civil Engineering Department.*

93.819 Master's Report Transportation (4 q.h. credits)

An individual effort consisting of laboratory and/or literature investigation and analysis or advanced design of a project in an area of transportation selected by student and adviser resulting in a definitive report. *Prep. Permission of the Civil Engineering Department.*

93.820 Thesis (Master's Degree) (8 q.h. credits)

Analytical and/or experimental work conducted by arrangement with and under the supervision of the department. *Prep. Permission of the Civil Engineering Department.*

mathematics and physics

For mathematics and physics courses consult the bulletin of the Graduate School of Arts and Sciences.

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July 1982

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List other activities since high school. Include military service, but omit summer and part-time work not relevant to professional goal. Indicate present employer, if now employed.

Employer	Location	Inclusive Dates	Position Held

Give the names and addresses of two people who are acquainted with your scholarship, training, and character.

Name	Address	Position

I hereby certify that the information given by me on this application is complete and accurate.

Applicant's signature _____ Date _____

The following should be on file in the Graduate School of Engineering for this application to be processed:

- Completed Application

- Official Transcripts
- Application Fee
- Other Documents as Required.

Do not write below this line.

Full-Time Students

Application Reviewed _____

Accepted _____

Admissions Committee

Date

Cooperative Education
Department, if necessary

Date

Denied ☐

Reason:

Signed _____

Part-Time Students

Application completed _____

Transcript received _____ Requested _____

Accepted _____ Denied _____

Department _____ Major _____

Regular _____ Provisional _____

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Special Requirements:

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Graduate School of Engineering
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The background of the cover is a light orange color, overlaid with several faint, technical-style drawings. In the top left, there is a curved structural diagram with labels like 'B', 'D', 'E', 'F', 'G', 'H', 'I', 'J', 'K', 'L', 'M', 'N', 'O', 'P', 'Q', 'R', 'S', 'T', 'U', 'V', 'W', 'X', 'Y', 'Z', 'AA', 'BB', 'CC', 'DD', 'EE', 'FF', 'GG', 'HH', 'II', 'JJ', 'KK', 'LL', 'MM', 'NN', 'OO', 'PP', 'QQ', 'RR', 'SS', 'TT', 'UU', 'VV', 'WW', 'XX', 'YY', 'ZZ', 'AAA', 'BBB', 'CCC', 'DDD', 'EEE', 'FFF', 'GGG', 'HHH', 'III', 'JJJ', 'KKK', 'LLL', 'MMM', 'NNN', 'OOO', 'PPP', 'QQQ', 'RRR', 'SSS', 'TTT', 'UUU', 'VVV', 'WWW', 'XXX', 'YYY', 'ZZZ', 'AAA', 'BBB', 'CCC', 'DDD', 'EEE', 'FFF', 'GGG', 'HHH', 'III', 'JJJ', 'KKK', 'LLL', 'MMM', 'NNN', 'OOO', 'PPP', 'QQQ', 'RRR', 'SSS', 'TTT', 'UUU', 'VVV', 'WWW', 'XXX', 'YYY', 'ZZZ'. In the top right, there is a large, stylized blue airplane. In the middle left, there is a circuit diagram with components labeled 'R20', 'C14', 'C13', 'R1', 'R2', 'R3', 'R4', 'R5', 'R6', 'R7', 'R8', 'R9', 'R10', 'R11', 'R12', 'R13', 'R14', 'R15', 'R16', 'R17', 'R18', 'R19', 'R20', 'C1', 'C2', 'C3', 'C4', 'C5', 'C6', 'C7', 'C8', 'C9', 'C10', 'C11', 'C12', 'C13', 'C14', 'C15', 'C16', 'C17', 'C18', 'C19', 'C20', 'C21', 'C22', 'C23', 'C24', 'C25', 'C26', 'C27', 'C28', 'C29', 'C30', 'C31', 'C32', 'C33', 'C34', 'C35', 'C36', 'C37', 'C38', 'C39', 'C40', 'C41', 'C42', 'C43', 'C44', 'C45', 'C46', 'C47', 'C48', 'C49', 'C50', 'C51', 'C52', 'C53', 'C54', 'C55', 'C56', 'C57', 'C58', 'C59', 'C60', 'C61', 'C62', 'C63', 'C64', 'C65', 'C66', 'C67', 'C68', 'C69', 'C70', 'C71', 'C72', 'C73', 'C74', 'C75', 'C76', 'C77', 'C78', 'C79', 'C80', 'C81', 'C82', 'C83', 'C84', 'C85', 'C86', 'C87', 'C88', 'C89', 'C90', 'C91', 'C92', 'C93', 'C94', 'C95', 'C96', 'C97', 'C98', 'C99', 'C100'. In the bottom right, there is a detailed architectural drawing of a building complex. In the bottom left, there is a blue, textured, dome-like shape.

***Lincoln College
Northeastern University
1982–84***



Lincoln College Northeastern University 1982–84

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360 Huntington Avenue
Boston, Massachusetts 02115*

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SAT			
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	24	NEW HAMPSHIRE	1 PM
	31	MAINE	1 PM
NOV	14	LEHIGH	1 PM
	21	BU	1 PM
		BYE WEEK	



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Northeastern University

Lincoln College

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Telephone 437-2500

_____ 19_____

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- ☐ Lincoln College Evening Programs
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- ☐ Will you please arrange for me to have an interview to discuss your program in _____
- ☐ I would like to apply for advance standing credit and shall arrange to submit transcripts of my records at all schools attended since high school.

Signature

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State

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(Summer schedule subject to change)

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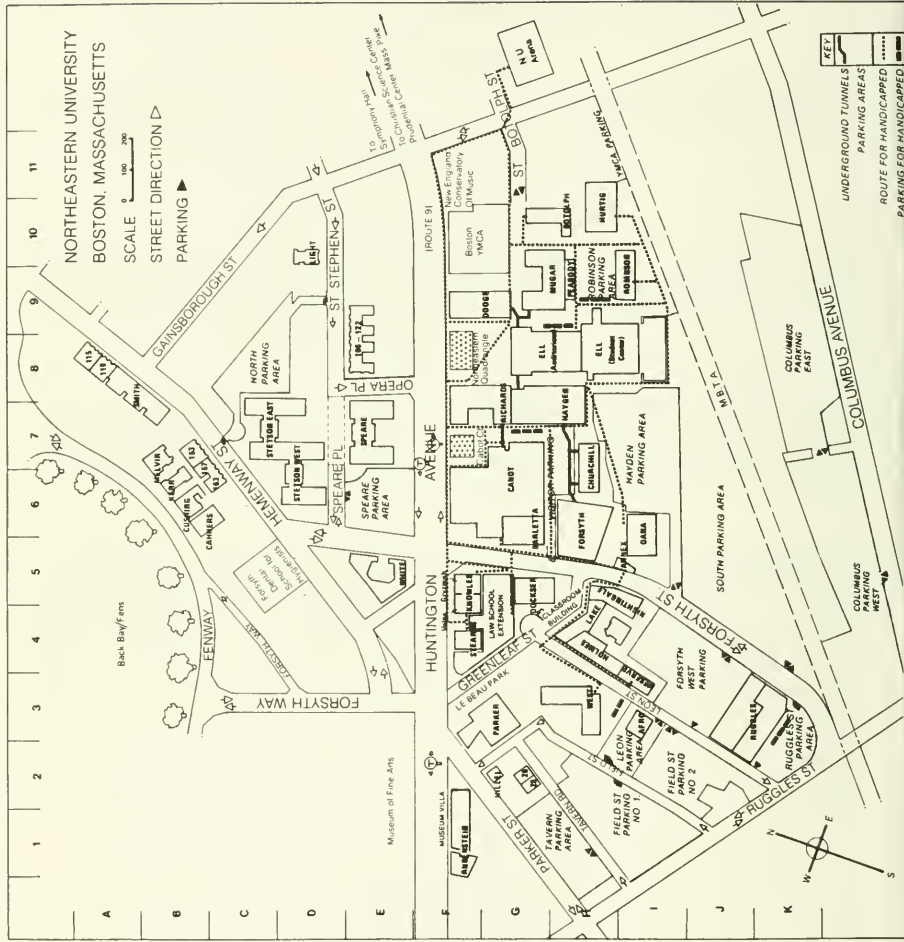
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- I3 Afro-American Institute
- G6 Barletta Natatorium
- F10 Boston YMCA
- G10 Botolph Building
- G6 Cabot Physical Education Building
- B6 Cahners Hall
- H6 Churchill Hall
- G4 Classroom Building
- B6 Cushing Hall
- I5 Dana Research Center
- G5 Dockser Hall
- G9 Dodge Library
- G8 Ell Student Building (Auditorium)
- H8 Ell Student Center (Student Lounge)
- H6 Forsyth Building
- I5 Forsyth Building Annex
- H7 Hayden Hall
- H10 Holmes Hall
- H10 Hurtig Hall
- B6 Kerr Hall (Faculty Center)
- F5 Knowles Center (Gryzmish Hall)
- F4 Knowles Center (Volpe Hall)
- H4 Lake Hall
- G4 Law School Extension
- J3 11 Leon Street
- J3 15 Leon Street
- I3 Meserve Hall
- G9 Mugar Life Sciences Building (Peabody Health Professions Center)
- I5 Nightingale Hall
- G12 Northeastern Arena
- G3 Parker Building
- H9 Peabody Center
- G7 Richards Hall
- J3 Ruggles (11, 15 Leon Street)
- I9 Robinson Hall
- F4 Stearns Center



1982-1983 ACADEMIC CALENDAR (times and dates subject to change)

Fall Quarter 1982 Classes Begin Monday, September 27, 1982

FALL REGISTRATION DATES

Boston	5:00-8:00 p.m.	Tuesday-Friday, September 7-10
	9:00-12 Noon	Saturday, September 11
	5:00-8:00 p.m.	Monday-Thursday, September 13-16
Burlington	5:00-8:00 p.m.	Monday-Thursday, September 13-16
	12:00-3:00 p.m. & 5:00-8:00 p.m.	Tuesday, September 14
Framingham North H.S.	5:30-8:00 p.m.	Tuesday, September 7 and Monday, September 13
Norwood Jr. H.S. North	5:30-8:00 p.m.	Wednesday, September 8 and Monday, September 13
Revere (Abraham Lincoln School)	5:30-8:00 p.m.	Thursday, September 9 and Tuesday, September 14
Westwood H.S.	5:30-8:00 p.m.	Thursday, September 9 and Tuesday, September 14
Weymouth North H.S.	5:30-8:00 p.m.	Wednesday, September 8 and Monday, September 13
Fall Quarter Classes Begin		Monday, September 27
Columbus Day Observed	No Classes	Monday, October 11
Veterans Day	No Classes	Thursday, November 11
Thanksgiving Recess	No Classes	Thursday-Saturday, November 25-27
Final Examination Period for Fall Quarter		Monday-Saturday, December 13-18

Winter Quarter 1983 Classes Begin Monday, January 3, 1983

WINTER REGISTRATION DATES

Boston	5:00–8:00 p.m.	Monday-Thursday, December 6–9
	5:00–7:00 p.m.	Friday, December 10
Burlington	5:00–8:00 p.m.	Monday-Thursday, December 6–9
Framingham North H.S.	5:30–8:00 p.m.	Monday, December 6 and Tuesday, December 7
Norwood Jr. H.S. North	5:30–8:00 p.m.	Monday, December 6 and Wednesday, December 8
Revere (Abraham Lincoln School)	5:30–8:00 p.m.	Tuesday, December 7
Westwood H.S.	5:30–8:00 p.m.	Tuesday, December 7 and Wednesday, December 8
Weymouth North H.S.	5:30–8:00 p.m.	Monday-Saturday, December 20–January 1
Christmas Vacation	No Classes	Monday, January 3 Saturday, January 15
Winter Quarter Classes Begin		
Martin Luther King Jr.'s Birthday	No Classes	Monday, February 21
Washington's Birthday	No Classes	Monday-Saturday, March 21–26
Final Examination Period for Winter Quarter		Monday-Saturday, March 28–April 2
Spring Recess (or make- up period for lost snow days)		

Spring Quarter 1983**Classes Begin Monday, April 4, 1983****SPRING REGISTRATION DATES**

Boston	5:00-8:00 p.m.	Monday-Thursday, March 14-17
	5:00-7:00 p.m.	Friday, March 18
Burlington	5:00-8:00 p.m.	Monday-Thursday, March 14-17
Framingham North H.S.	5:30-8:00 p.m.	Monday, March 14 and Tuesday, March 15
Norwood Jr. H.S. North	5:30-8:00 p.m.	Monday, March 14 and Wednesday, March 16
Revere (Abraham Lincoln School)	5:30-8:00 p.m.	Tuesday, March 15
Westwood H.S.	5:30-8:00 p.m.	Monday, March 14 and Wednesday, March 16
Weymouth North H.S.	5:30-8:00 p.m.	Monday, April 4
Spring Quarter Classes Begin		Monday, April 18
Patriot's Day Observed	No Classes	Monday, May 30
Memorial Day Observed	No Classes	Monday-Saturday, June 13-18
Final Examination Period for Spring Quarter		Sunday, June 19
Commencement		

Summer Quarter 1983 Classes Begin Monday, June 20, 1983

REGISTRATION FOR ENTIRE SUMMER QUARTER

Boston	5:00–8:00 p.m.	Tuesday-Friday, May 31–June 3
Burlington	1:00–3:00 p.m. & 5:00–8:00 p.m. 5:00–8:00 p.m.	Tuesday, May 31 Wednesday, June 1
Summer Quarter Classes Begin		Monday, June 20

REGISTRATION FOR SECOND FIVE-WEEK TERM

Boston	5:00–8:00 p.m.	Monday, July 18 and Tuesday, July 19
Burlington	5:00–8:00 p.m.	Monday, July 18
Independence Day Observed	No Classes	Monday, July 4
Labor Day Observed	No Classes	Monday, September 5
Final Examination Period for Summer Quarter		Held during last class session of each term

1983-1984 ACADEMIC CALENDAR (times and dates subject to change)

Fall Quarter 1983 Classes Begin Monday, September 26, 1983

Fall Quarter Classes Begin		Monday, September 26
Columbus Day Observed	No Classes	Monday, October 10
Veterans Day	No Classes	Friday, November 11
Thanksgiving Recess	No Classes	Thursday-Saturday, November 24-26
Final Examination Period for Fall Quarter		Monday-Saturday, December 12-17

Winter Quarter 1984 Classes Begin Tuesday, January 3, 1984

Christmas Vacation	No Classes	Monday-Monday, December 19-January 2
Winter Quarter Classes Begin		Tuesday, January 3
Martin Luther King Jr.'s Birthday	No Classes	Monday, January 16
Washington's Birthday	No Classes	Monday, February 20
Final Examination Period for Winter Quarter		Monday-Saturday, March 19-24
Spring Recess (or make- up period for lost snow days)		Monday-Saturday, March 26-31

Spring Quarter 1984**Classes Begin Monday, April 2, 1984**

Spring Quarter Classes Begin

Monday, April 2

Patriot's Day Observed

No Classes

Monday, April 16

Memorial Day Observed

No Classes

Monday, May 28

Final Examination Period
for Spring QuarterMonday-Saturday,
June 11-16

Commencement

Sunday, June 17

Equal Opportunity Policy

Northeastern University is committed to a policy of providing equal opportunity to all. In all matters involving admissions, registration, and all official relationships with students, including evaluation of academic performance, the University insists on a policy of nondiscrimination.

Northeastern University is also an equal opportunity employer; it is institutional policy that there shall not be any discrimination against any employee or applicant for employment because of race, color, religion, sex, age, national origin, or on the basis of being a handicapped, but otherwise qualified, individual. Further, Northeastern will not condone any form of sexual harassment.

Inquiries concerning our equal opportunity policies may be referred to the University Title IX Coordinator/Compliance Officer for Section 504 of the Rehabilitation Act of 1973, Affirmative Action Office, 175 Richards Hall, 617-437-2133.

Emergency Closing of the University

Northeastern University has made arrangements to notify students, faculty, and staff by radio when it becomes necessary to cancel classes because of extremely inclement weather. Radio stations WBZ, WEEI, WHDH, WJDA, WRBB, WCOZ, WRKO, WLYN, WKOX, WHAV, WBCN-FM, WVBF-FM, WHUE, and WLLH will announce the University's decision to close.

Office of Services for the Handicapped

The Office of Services for the Handicapped (OSH) provides a variety of support services and general assistance to all Northeastern's disabled students and employees. The University's efforts to comply with the Rehabilitation Act of 1973 are coordinated by Ruth Bork, OSH Director, 5 Ell Center, (617) 437-2675.

Delivery of Services

The University assumes no liability, and hereby expressly negates the same, for failure to provide or delay in providing educational or related services or facilities or for any other failure or delay in performance arising out of or due to causes beyond the reasonable control of the University, which causes include, without limitation, power failure, fire, strikes by University employees or others, damage by the elements, and acts of public authorities. The University will, however, exert reasonable efforts, when in its judgment it is appropriate to do so, to provide comparable or substantially equivalent services, facilities, or performance, but its inability or failure to do so shall not subject it to liability.

The Northeastern University catalog contains current information regarding the University calendar, admissions, degree requirements, fees, and regulations, and such information is not intended to be and should not be relied upon as a statement of the University's contractual undertakings.

Northeastern University reserves the right in its sole judgment to promulgate

and change rules and regulations and to make changes of any nature in its program, calendar, admissions policies, procedures and standards, degree requirements, fees, and academic schedule whenever it is deemed necessary or desirable, including, without limitation, changes in course content, the re-scheduling of classes, cancelling of scheduled classes and other academic activities, and requiring or affording alternatives for scheduled classes or other academic activities, in any such case giving such notice as is reasonably practicable under the circumstances.

We at Northeastern will do our best to make available to you the finest education we can provide, the most stimulating atmosphere in which to learn, and the most congenial conditions under which you may enjoy the learning experience. But the quality and the rate of progress of your academic career is in large measure dependent upon your own abilities, commitment, and effort. You will be a full participant in an educational partnership. We will and, indeed, can only make the opportunities available to you; it is up to you to take advantage of them.

This is equally true with your career upon graduation. We cannot guarantee that you will obtain any particular job; that will depend upon your own skills, achievement, presentation, and other factors such as market conditions at that time. Similarly, in many professions and occupations there are increasing requirements imposed by federal and state statutes and regulatory agencies for certification or entry into a particular field. These may change during the period of time when you are at Northeastern and they may vary from state to state. While we will be ready to help you find out about these requirements and changes, it is your responsibility to initiate the inquiry because we cannot know what your expectations and understandings are unless you tell us.

In brief, what we are saying to you is that we are here to offer you educational opportunities and choices and to assist you in finding the direction in which you want to steer your educational experience. But you are a partner in this venture with an obligation and responsibility to yourself.

Family Educational Rights and Privacy Act

In accordance with the Family Educational Rights and Privacy Act of 1974, Northeastern University permits its students to inspect their records wherever appropriate and to challenge specific parts of them when they feel it necessary to do so. Specific details of the law as it applies to Northeastern are printed in the *Student Handbook* and are distributed annually at registrations of University College and the graduate schools.

Fee Disclaimer

Tuition rates, all fees, rules and regulations, courses and course content are subject to revision by the President and the Board of Trustees at any time.

Accreditation

Northeastern University is accredited by the New England Association of Schools and Colleges, Inc., which accredits schools and colleges in the six New England states. Accreditation by the Association indicates that the institution has been carefully evaluated and found to meet standards agreed upon by qualified educators.



the university

Founded in 1898, Northeastern University is incorporated as a privately endowed, nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature, by special enactment, has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of almost 200 distinguished business and professional men and women.

From its beginning, Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these needs in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Arts and Sciences (1935), Education (1953), Pharmacy (1962), Nursing (1964), Boston-Bouvé College (1964), Criminal Justice (1967), Lincoln College's Engineering Technology Programs (1971), and by University College in a special pilot program (1980). As an educational method, the Cooperative Plan offers students the opportunity to gain valuable practical experience as an integral part of their college programs, and also provides the means by which they may contribute to the financing of their education. The Plan has been extended to the graduate level in engineering, mathematics, rehabilitation administration, professional accounting, business administration, and law.

In the field of adult education, programs of study have been developed to meet a variety of needs. Since 1906, evening curricula have been offered leading to the bachelor's degree. Programs in the arts and sciences, engineering, various fields of business, law enforcement and security, and other areas have been carefully planned to serve mature students who are employed full time during the day and want to broaden their educational background by part-time study. All formal courses of study leading to degrees through evening

programs are approved by the Basic College faculties concerned and are subject to the same quantitative and qualitative standards as the regular day curricula.

UNDERGRADUATE COLLEGES

College of Arts and Sciences

The College of Arts and Sciences offers majors in the arts and sciences leading to the Bachelor of Arts or Bachelor of Science degree. Curricula are normally four years in length on a full-time plan or five years in length on the Cooperative Plan.

Boston-Bouvé College of Human Development Professions

Boston-Bouvé College offers programs of study leading to the degree of Bachelor of Science in Education in the fields of elementary education, human services, physical education, recreation and leisure studies, school and community health education, secondary education, and speech-language pathology and audiology, as well as a Bachelor of Science in Physical Therapy.

College of Business Administration

The College of Business Administration offers programs of study in principal fields of business leading to the Bachelor of Science degree in Business Administration.

The College also sponsors a Center for Management Development, which annually conducts intensive programs designed to provide professional growth for experienced managers. The plan of instruction, based on a modification of the Northeastern cooperative program, permits the participants to maintain their job responsibilities during the five-month period of the course. The Management Development Program is conducted at Andover, Massachusetts, on the campus of Phillips Academy. The Center also conducts management workshops, scheduled on 12 Fridays and offering four core areas of management study.

The Bureau of Business and Economic Research provides administrative assistance to research projects carried out under faculty leadership and supervision.

College of Computer Science

The Bachelor of Science degree in Computer Science is offered.

College of Criminal Justice

The College of Criminal Justice offers a full-time day curricula on the Cooperative Plan, leading to the degree of Bachelor of Science.

College of Engineering

The College of Engineering offers five-year cooperative curricula in civil (including an environmental engineering option), mechanical, electrical (including a power systems option and a computer engineering option), chemical, indus-

trial engineering, and information systems leading to the degree of Bachelor of Science with specification according to the engineering department in which the student qualifies. A more general program without specification leading to the Bachelor of Science degree is offered in which students design their curriculum around a core of science, engineering science, and engineering courses. For highly qualified students, most departments offer a five-year program leading to both Bachelor's and Master's degrees; students carry course overloads beginning in the third year. The College also offers, during evening hours, part-time programs leading to Bachelor of Science degrees in Civil, Mechanical, and Electrical Engineering, extending over eight years and meeting the same qualitative and quantitative standards of scholarship as the day curricula.

Lincoln College

Lincoln College offers engineering technology programs leading to the Associate in Engineering, the Associate in Science, and the Bachelor of Engineering Technology degrees. These programs are made available as:

- (a) A full-time day curricula on the Cooperative Plan leading to the degree of Bachelor of Engineering Technology (B.E.T.) in Mechanical or Electrical Engineering.
- (b) A part-time evening program including pretechnology preparatory courses and degree programs leading to the Associate in Engineering (A.E.); and the Bachelor of Engineering Technology (B.E.T.) in Civil, Mechanical, or Electrical Engineering.
- (c) Lincoln College part-time students whose work schedule does not permit them to attend regular evening classes may register for a maximum of eight quarter hours of course work per quarter in the Lincoln College day program.

Registration materials will be available Monday through Friday in Room 408 Churchill Hall, Boston Campus only, during the week preceding the start of each quarter. The day class schedule will not be available at other campus locations. The Registrar will not accept registration materials for day classes without the approval of the Director of Lincoln College.

The day B.E.T. program is designed to meet the needs of the high school graduate or the student transferring from a community college or technical institute, and who desires the full-time day curricula on the Northeastern Cooperative Plan.

In addition to its traditional curricula, Lincoln College Evening School offers interdisciplinary programs providing technological and professional development opportunities to meet special needs of the part-time student. These programs are designed to provide trained people for ready assimilation by the engineering field and to give students the opportunity to prepare for the challenge of interfacing technology and society.

College of Nursing

The College of Nursing offers programs leading to a Bachelor of Science degree in nursing, with special programs designed for licensed practical nurses or registered nurses.

College of Pharmacy and Allied Health Professions

The College of Pharmacy and Allied Health Professions offers five-year co-operative curricula leading to the degree of Bachelor of Science in Pharmacy, Bachelor of Science in Respiratory Therapy, Bachelor of Science in Toxicology, and to the Bachelor of Science degree with majors in medical laboratory science and medical record administration. Associate degree programs are offered in medical laboratory technology, respiratory therapy, and dental hygiene. The College has academic responsibility and, in cooperation with the medical schools and teaching hospitals in the Boston area, offers the professional program for physician assistants.

University College

University College, so called because it draws upon the resources of the other colleges of the University, offers part-time day and evening programs in arts and sciences, business administration, law enforcement, education, health professions, and therapeutic recreation service programs, leading to the Associate in Science, Bachelor of Arts, and Bachelor of Science degrees. It does not duplicate the offerings of the day colleges, but provides curricula which cut across traditional subject-matter areas to meet the particular needs of adult students. Students may pursue a degree or simply take courses, based on needs and interests, up to a total of 39 or 40 quarter hours of credit. Courses are offered in Boston as well as in Burlington, Framingham, Milford, Revere, Weymouth, Brockton, Norwood, Marshfield, Sandwich, Belmont, Westwood, Dedham, Lynnfield, and Marlborough.

Adult Day Programs refer to University College courses offered Monday through Friday, 9:00 a.m. to 5:00 p.m., to meet the needs of adults with family or other obligations who wish to engage in part-time study during the day. In addition to the daytime offerings of regular University College credit courses, Adult Day Programs also offer workshops and conferences, sometimes over weekends, with the option for credit. Adult Day Programs are offered primarily on the Boston and Burlington Campuses, with a limited number of courses offered at other off-campus locations.

Students may enroll as degree candidates or elect single courses appropriate to their needs and interests. Courses are scheduled in the day and evening at the Boston Campus, Suburban Campus in Burlington, and other off-campus locations near Boston.

GRADUATE SCHOOLS

Arts and Sciences

The Master of Arts degree may be earned in Economics, English, History, Political Science, Psychology, Sociology, and Social Anthropology. The Master of Science degree is available in Biology, Chemistry, Economics Policy and Planning, Mathematics, and Physics. The Master of Science in Health Science and the Master of Public Administration degrees are also offered. In addition, there are an advanced Literary Study Program leading to the Certificate of Advanced Graduate Study and programs leading to the Doctor of Philosophy degree in Biology, Chemistry, Economics, Mathematics, Physics, Psychology, and Sociology. An interdisciplinary Ph.D. Program is offered in Forensic Chemistry with the College of Criminal Justice. Most programs may be completed through either full- or part-time study.

Boston-Bouvé College of Human Development Professions

The Master of Science degree may be earned, with specialization in Physical Education, Physical Therapy, or Recreation and Leisure Studies. Graduate courses in Health Education are available as electives within the College and for special students. Programs may be completed through full- and part-time study.

The Master of Education degree may be earned, with specialization in Community Mental Health Counseling, Curriculum and Instruction, Early Childhood Education, Educational Administration, Educational Research, Human Development Industrial Counseling Rehabilitation, Special Education School and College Counseling, or Speech-Language Pathology and Audiology. The Certificate of Advanced Graduate Study is offered in Counselor Education, Curriculum and Instruction, Educational Administration, Rehabilitation Counseling, and Social Sciences. The Doctor of Education degree may be earned in Administration, with specialization in Counselor Education, Educational Administration, or Rehabilitation and Special Education.

The master's degree program in Speech-Language Pathology and Audiology is accredited by the Education and Training Board of the Boards of Examiners in Speech Pathology and Audiology.

Business Administration

A Master of Business Administration degree may be earned. The Graduate School of Business Administration offers a variety of programs to meet the needs and schedules of graduate business students. For those interested there are two program alternatives: a twenty-one-month Management Intern Program, which includes a six-month, paid professional internship; or a two-year traditional full-time program, which may include administrative or teaching assistantship opportunities. Individuals who wish to continue their full-time job responsibilities while earning an M.B.A. degree may consider the evening part-time program of study, the eighteen-month Executive M.B.A. Program for upper-

level managers, or the accelerated part-time High Technology M.B.A. for qualified technical specialists. The Master of Science degree in professional accounting is an intensive, full-time program specifically designed for liberal arts and other nonaccounting majors. In addition, there is a Program for Advanced Study in Business Administration leading to the Certificate of Advanced Study in Business Administration.

Criminal Justice

The College of Criminal Justice offers both full- and part-time programs leading to a Master of Science degree in Criminal Justice and a Master of Science degree in Forensic Chemistry. Students enrolled in the Master of Science program in Criminal Justice choose among three major concentrations of study—administration and planning, criminology, and correctional counseling. The Master of Science program in Forensic Chemistry provides an integrated survey of forensic science as utilized in criminalistics, toxicology, and related professional fields. An interdisciplinary Ph.D. program in Forensic Chemistry is also offered with the College of Arts and Sciences, with specialization in Forensic Toxicology, Forensic Materials Science, or Forensic Analytical Chemistry. Students in either program attend classes during late afternoon and evening hours.

Engineering

Master of Science degrees are offered with course specifications in the fields of Civil, Chemical, Electrical, Industrial, Mechanical, Transportation, Engineering Management and Information Systems. A six-year program leading to both a Bachelor's and Master's degree is offered in Electrical Engineering, Mechanical Engineering, and Power Systems. Professional Engineers degrees are offered in Electrical, Industrial, and Mechanical Engineering. We also offer a Women in Engineering Program. Ph.D. degrees are offered in Civil, Chemical, Electrical, and Mechanical Engineering. A Doctor of Engineering degree in Chemical Engineering is offered in addition to the Ph.D.

Law

The School of Law offers a full-time program of professional instruction leading to the degree of Juris Doctor (J.D.). The three-year curriculum includes 12 months of professional experience in law offices, governmental agencies, or other law-related employment. There are no courses for part-time or evening students.

Pharmacy and Allied Health Professions

The Master of Science degree is offered in Clinical Chemistry, Hospital Pharmacy, Medical Laboratory Science, Medicinal Chemistry, Pharmacology, and Radiopharmaceutical Science. The Ph.D degree is offered in Biomedical Science with specialization in Medical Laboratory Science, Medicinal Chemistry, Pharmaceutical Science, or Pharmacology. An interdisciplinary doctoral degree

is available in Forensic Chemistry as well as a graduate program in Clinical Pharmacy which leads to the degree Doctor of Pharmacy (Pharm. D).

Professional Accounting

A five-quarter curriculum leading to the degree of Master of Science in Accounting.

Some of the above programs are offered on the Cooperative Plan; others provide teaching and research fellowships for able candidates. The graduate schools are under the jurisdiction of the basic college deans.

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national levels.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

OFFICE OF LEARNING RESOURCES

The Office of Learning Resources provides faculty, students, and staff with a variety of instructional services, equipment, and learning facilities.

The Learning Center furnishes students with individualized study and language lab facilities for remedial, supplementary, or enrichment purposes in many subject areas and in many formats—programmed texts, audiotapes, videotapes, and sound filmstrips, among others. A listening lounge, equipped with a stereophonic sound system, supplies a large selection of classical and popular prerecorded music. Students may use all facilities independently or to complete class assignments at no cost during day, evening, and weekend hours.

The Learning Resources Center is located in 406 Dodge Library and is open seven days a week. Telephone 437-2465 for further information.

The Media Production Laboratory provides facilities for both students and faculty for producing original materials, such as overhead transparencies, audiotapes, illustrations, slides, posters, and charts. Training is given in the use of all equipment, including that used for television production.

Campus Media Services makes available all types of audiovisual and video equipment and instructional materials for the support of classroom instruction on a prescheduled basis. Certain equipment is reserved for student use, and

students may borrow instructional materials with faculty approval. A catalog of all instructional materials is available at no charge.

The Instructional Materials Center, which acquires and maintains the collection of University-owned instructional materials, also provides a rental service for 16mm films and videotapes obtained from outside sources. Faculty who would like to evaluate instructional materials before purchase may do so through its preview service and facilities.

The Instructional Development Center assists individual faculty with specifying instructional goals, reviewing related literature and materials, examining alternative teaching strategies, producing learning materials, and evaluating course effectiveness. Its training in presentation and teaching techniques is complementary to its basic function of developing instructional units and courses.

DAY PROGRAMS FOR ADULTS

These programs were developed to meet the needs of adults who wish to engage in part-time study during the day only. Noncredit courses and undergraduate and graduate degree programs are offered at the Boston and Burlington campuses. Included are courses from the graduate Boston-Bouvé College of Human Development Professions, the Graduate School of Arts and Sciences, University College, and the Center for Continuing Education. A Human Relations and Adult Counseling Program is also offered.

AFFILIATED PROGRAMS

Dental Hygienists

The Forsyth School for Dental Hygienists conducts a two-year program of dental hygiene education and general education in cooperation with Northeastern University. Graduates receive the Certificate in Dental Hygiene from Forsyth and the degree of Associate in Science from Northeastern University. After receiving the Associate degree, students may pursue the Bachelor of Science degree from University College on a part-time basis.

Aeronautical Technology

Lincoln College conducts full-time day programs in Aeronautical Technology in which the student earns the Associate in Science degree and may become licensed by the Federal Aviation Administration with commercial, instrument, and instructor pilot ratings.

Health Record Administration

The University, in affiliation with several area hospitals, offers a three-year part-time evening program leading to certification in Health Record Administration for students who already hold a Bachelor's degree and wish to qualify for the professional examination leading to registration as a record librarian.

Medical Technologists, Cytotechnologists, Hematologists

In cooperation with area teaching hospitals, Northeastern University offers a full-time day program on the Cooperative Plan leading to the degree of Bachelor of Science with concentration in Medical Technology.

Bachelor of Science degree programs in Medical Technology and Hematology and an Associate degree in Cytotechnology are offered on a part-time basis by University College in cooperation with several approved hospital schools.

Nurses

Northeastern University offers instruction in the sciences, humanities, and social studies for student nurses working for their Associate or Baccalaureate degree.

Physician Assistants

In cooperation with the Massachusetts Medical Society, Northeastern offers an 18-month program for the primary care physician assistant. Clinical rotations, supplemental to courses taken on campus, take place at Boston-area hospitals.

Radiologic Technologists

University College, in collaboration with several American Medical Association-affiliated hospitals in the New England area, conducts a program leading to eligibility for certification as a registered Radiologic Technologist and the Associate in Science degree. The program is accredited by the Joint Review Committee on Education in Radiologic Technology of the American Medical Association.

Respiratory Therapists

This program is conducted by the College of Pharmacy and Allied Health Professions in affiliation with local hospitals.



buildings and facilities

Main Campus

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 50 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Some are interconnected by underground passageways.

Carl S. Eli Student Center

The Carl S. Eli Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

University Library System

The University Library System includes the Dodge Library and the three graduate libraries: Chemistry, 112 Hurtig Hall, which includes Chemical Engineering, Biology, Pharmacy, and the Health Sciences; Physics/Electrical Engineering, 324 Dana Hall; and Mathematics/Psychology, 531 United Realty Building. The Suburban Campus Library supports the programs at Burlington. Other collections are Marine Science and Maritime Studies Center at Nahant, Center for Management Development at Andover, and Aeronautical Technology at Norwood. There is also the Law Library, located in the Knowles Center, and the Curriculum Resources Library in Cahners Hall.

The University Library collections number more than 464,099 bound volumes and 500,000 microform volumes. The periodical titles number 4,000, additional continuation titles 1,243, and sound recordings 10,953.

1. The Reference Collection in the Cabot Reading Room on the main floor of the Dodge Library contains 20,000 volumes. This collection is of major importance to anyone using the library. The researcher should be aware of the source books, handbooks, bibliographies, and similar aids before beginning an investigation of the literature.

The Reference Division includes the Government Documents Collection located in 14 Dodge, and the Microforms Collection located in 108 Dodge. Additional sources of information are the Business Services, Technical Reports, Annual/Company Reports, and the Information File for pamphlet materials.

2. The Periodical Collection in the Webster Reading Room on the main floor consists of Indexing and Abstracting Services, and the current periodicals mainly in literature, humanities, social sciences, and general science, as well as foreign and domestic newspapers.

This collection supports the Reference Collection and updates the General Collection by encompassing the latest developments in all fields of knowledge.

The Periodical Stacks are adjacent to the collection and are serviced by the library staff.

3. The General Collection is located on the three floors and two stack levels of the Dodge Library indicated by posted floor plans and guides available at the Information Desk.
4. The Reserve Book Collection is located in 204 Dodge. This is an important and widely used collection of textbooks and assigned reading to support the classroom lecture and laboratory, and for further in-depth information.
5. The Public Catalog located on the main floor includes author, title, and subject cards for the foregoing collections, except for documents, technical reports, and complete entries for periodicals, which will be found in catalogs in those areas. The Public Catalog includes both the Dewey Decimal classification and the Library of Congress classification.
6. The Circulation Department manages the organization of the General Collection. Materials are charged out and returned at the Circulation Desk. A daily computer printout of items on loan is available to assist in locating books not found on the shelves.
7. The Inter-Library Loan Department is located in 18 Dodge. This service should be used for materials not available in the system and for serious research.
8. The Music Reference Service is located in 406 Dodge. This collection of books, scores, records, and tape cassettes is for assigned listening and personal enjoyment. The collection contains both music and spoken word.
9. The Learning Center, 406 Dodge, is a service for programmed and language instruction utilizing audio/visual/video equipment teaching programs to support classroom work and independent study.
10. It should be understood that the Divisional Libraries, the Burlington Campus Library, and the Law School Library have the same services and card

catalogs as the main Dodge Library with respect to other specific academic disciplines.

LIBRARY HOURS

Dodge Library

Mon.—Thurs.	7:45 a.m. to 10:00 p.m. (10:00 p.m. to midnight)*
Friday	7:45 a.m. to 7:30 p.m.
Saturday	12:00 noon to 4:00 p.m. (4:00 p.m. to 10:00 p.m.)*
Sunday	12:00 noon to 4:00 p.m. (4:00 p.m. to midnight)*

* References and Periodicals; for study only.

Divisional Libraries

Mon.—Thurs.	8:30 a.m. to 10:00 p.m.
Friday	8:30 a.m.—7:30 p.m.
Saturday—Sunday	Closed

Suburban Campus Library, Burlington

Mon.—Thurs.	8:30 a.m. to 9:00 p.m.
Friday	8:30 a.m. to 5:00 p.m.
Saturday	8:30 a.m. to 1:00 p.m. (alternate Saturdays)
Sunday	Closed

Cabot Physical Education Center

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. It contains four basketball courts, an athletic cage, a small gymnasium, and a Nautilus room, as well as administrative offices for the Department of Men's Athletics and for the Physical Education Department of the Boston-Bouvé College of Human Development Professions.

The Barletta Natatorium houses a 105-foot swimming pool, a practice tank for the crew, handball/racquetball courts, and shower and dressing facilities.

Dockser Hall

Charles and Estelle Dockser Hall, completed in 1968, houses a large gymnasium, dance studio, motor performance laboratory, library, community recreation laboratory, folk arts center, darkroom, recreation resources area, locker rooms, offices, classrooms, conference room and lounge, storage facilities, and a research laboratory.

SUBURBAN FACILITIES

Suburban Campus

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science, education, and the arts, portions of undergraduate programs leading to the Associate and Bachelor's degrees, special programs for adults, and noncredit state-of-the-art programs are offered.

Henderson House

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is 12 miles from the main campus.

Warren Center

The Warren Center serves as a practical laboratory for students in Boston-Bouvé College of Human Development Professions. Its athletic fields and tennis courts, ropes course, natural setting of lake, woods, fields, streams, winterized cottages, and Hayden Lodge provide year-round opportunities for outdoor learning twenty-five miles from the Boston campus. Courses, conferences, seminars, and workshops are conducted at the Center throughout the year and thus serve University and community needs.

Marine Science and Maritime Studies Center

The Marine Science and Maritime Studies Center at Nahant, Massachusetts, located about 20 miles northeast of Boston, is a research and instruction facility engaged primarily in studies of marine biology and oceanography. The Institute is operated all year.

lincoln college administration

Administrative Officers

Thomas E. Hulbert, B.Mgt.E., M.S.

Director

Jacob Wiren, B.S., M.S., P.E.

Assistant Director

Rasma Galins, B.S.

Assistant to the Director

David A. Fraizer, B.S.

Counselor

Student Counseling Staff

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Rasma Galins

President, Adult Student Council

Academic Standing Committee

Rasma Galins, *Chair*

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(Basic Mathematics)

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(Course Consultant, Calculus)

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(Electrical & Electronic Graphics)

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(Mathematics for Business Mgmt.)

John Kaczorowski, Jr., B.S., M.S.
(Electronic Labs.)

George F. Kent, B.S., M.S., P.E.
(Materials)

Robert S. Lang, B.S., Ed.M.
(Engineering Graphics)

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(Course Consultant, Physics)

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(Stress Analysis, Adv. Stress Analysis)

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(Linear Active Cir. Des., Electronics, & Prin. of Comm. Systems)

Robert L. Meserve, B.S., M.S.
(Fluid Mechanics)

Walter Messcher, B.M.E., M.S.
(Program Consultant, Computer Technology)

Ernest E. Mills, B.S., M.S., P.E.
(Program Consultant, Mechanical Engineering Tech., Day and Evening Programs)

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(Program Consultant, Electrical Engineering Technology, Day and Evening Programs)

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(Analog, Digital & Hybrid Computers, Digital Systems)

Ralph W. Sexton, B.S., M.S.P.E.
(Mechanical Tech. Laboratory)

Raimundas Sukys, B.S., M.S.
(Pulse Circuits, Integrated Circuits)

Joel Weinstein, B.S.
(Microprocessor Hardware)

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(Statics and Dynamics)

Office Staff

Karen D. Midgley, Secretary

Elsie Chan, Secretary of Exams

Rosanne L. Bogan, Secretary of Records

Janet A. Abdel-Rehim, Secretary



the role and scope of lincoln college

Purpose

Lincoln College is charged with the responsibility for developing and offering college-level courses and curricula of an applied-science or technological nature. Its purpose is to assist professional personnel, qualified to deal with the applications and uses of the biological, natural, and physical sciences in better meeting community needs. The programs of study conducted by the College have in common the following purposes and characteristics:

1. The programs of instruction offer the student the opportunity to prepare for activities allied to the fields of engineering, science, or medicine, but are more specialized than those required to prepare a person for full professional responsibilities.
2. The programs of instruction are more concise and more completely technological in content than professional curricula, although they are concerned with the same general fields of scientific, engineering, industrial, or clinical specialization.
3. The programs of instruction are based upon principles of science, and include post-secondary school mathematics to provide the tools to achieve the technological objectives of the curricula.
4. Emphasis is placed upon the use of rational processes in converting theories and ideas into practical techniques, procedures, and products.
5. Extensive training for artisanship or craftsmanship is not included within the scope of the technological education programs.
6. Graduates from the Associate degree programs have opportunities for educational work leading to the Bachelor of Engineering Technology and Bachelor of Science degrees.

Technology and the Technologist

Scientific and technological skills range over a broad spectrum, from extremely simple craftsmanlike activity to highly complex and abstract activity. At one end of the spectrum is the professional whose work is mostly theoretical in character. He or she studies, reasons, and visualizes how new knowledge may be used in the development of solutions to technical problems. This person usually is not completely knowledgeable in the detailed procedures used by the skilled craftsman who executes the ideas, procedures, and designs.

The technologist is the pivot-person on the professional-technologist-craftsman team. The technologist usually works with the professional engineer, sci-

entist, doctor, supervisor, and craftsman in converting knowledge of scientific theories and practical craftsmanship into products, procedures, and techniques.

When employed in research, design, or development, the technologist usually acts as direct supporting personnel to the professions. Functioning in a capacity related to production, operation, testing, or control, he or she usually follows a course prescribed by a professional, but may not work closely under the professional's direction. If installation, maintenance, or sales are the areas of responsibility, the technologist is frequently performing a task that would otherwise have to be performed by the professional, thereby assuming the more routine professional functions demanded by our increasingly scientific and technical society.

In executing all functions, the technologist is normally required to use a high degree of rational thinking and to employ post-secondary school mathematics and the principles of the biological, natural, and physical sciences. The skilled technologist works with the mind as well as the hands, and considers why, as well as how, things work. The technologist must effectively communicate technical and scientific information mathematically, graphically, and linguistically.

The Need for Technologists

Our present technological age, with its exploding accumulation of new information and discoveries in the physical, natural, and life sciences, has increased the need for people with specialized training in science and technology. Experts have recently estimated that in order to meet expanding needs, the number of students graduating from the nation's professional schools must double—a goal which is improbable in the near future.

The most reasonable alternative is to make our professional manpower most efficient by providing assistance in the form of specially trained technologists. Manpower experts believe that the present ratio of less than one technologist to each professional should ideally be nearer five to one.

Opportunities for technologists are increasing. The technologist's employment opportunities are varied and include positions in health and public service organizations; atomic energy and electric power industries; metal fabricating industries; local, state, and Federal government agencies; the armed forces; aerospace industries; chemical, petroleum, plastics, and metal industries; and transportation and communication industries among others.

PROGRAMS OF INSTRUCTION

Recognizing the growing need for technicians and technologists and their expanding role in modern society, Lincoln College offers Pre-Technology Preparatory Courses and degree programs leading to the Associate in Engineering (A.E.), Associate in Science (A.S.), and Bachelor of Engineering Technology (B.E.T.) degrees as follows:

Pre-Technology

Introductory Mathematics, Basic Mathematics, Physics,
and English pages 66-67

Reading Improvement Program (noncredit)	page 67
Programmed Study Review Courses (noncredit)	page 67

Aeronautical Technology

Aeronautical Technology (A.S. degree)—2 years (days)	page 68
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Civil Engineering Technology

Architectural Engineering Technology (A.E. degree)	page 70
Environmental Engineering (A.E. degree)	page 71
Structural Engineering Technology (A.E. degree)	page 72
Surveying and Highway Engineering Technology (A.E. degree)	page 74
Civil Engineering Technology (B.E.T. degree)	page 75

Electrical Engineering Technology

Electrical Engineering Technology (A.E. degree)	page 78
Electrical Engineering Technology (B.E.T. degree)	page 79
Electrical Engineering Technology (B.E.T. degree).....	page 81
(Day Cooperative Curriculum)	

Mechanical Engineering Technology

Mechanical Engineering Technology (A.E. degree)	page 83
Mechanical Engineering Technology (B.E.T. degree)	page 84
Mechanical Engineering Technology (B.E.T. degree)	page 87
(Day Cooperative Curriculum)	

Interdisciplinary Science and Engineering Technology Programs

Computer Technology (A.E. degree)	page 89
Computer Technology (B.E.T. degree)	page 90
Mechanical-Structural Engineering (B.E.T. degree)	page 92

COLLEGE OF ENGINEERING

Part-time Electrical, Civil, and Mechanical Engineering Programs (B.S. degree)

These programs are designed for fully qualified young men and women who:

1. because of family responsibilities must continue to be gainfully employed full time during the day, but who wish to advance by devoting leisure time to their own professional development;
2. were in the top half of their high school class, but at graduation were financially unable to continue their education at the college level; those who did not enjoy top-half standing may require refresher study;

3. realize that the most effective way to achieve their full potential in these days of specialization is to earn a college degree.

All courses in these part-time curricula are identical with those offered in the five-year, day cooperative programs and are taught by the same faculty.

The University reserves the right to withdraw, modify, or add to the courses offered or to change the order or content of courses in any curriculum.

Admission Requirements for the College of Engineering

It is important that applicants for admission to the College of Engineering complete the full sequence of secondary school courses in English, Mathematics, and Science. The following subjects should be included: English (four years), Physics or Chemistry, Algebra (through quadratics), Plane Geometry, and Trigonometry.

Admission testing requirements may be met in one of three ways:

1. by submitting the results of the College Board Scholastic Aptitude Test previously completed;
2. by writing the College Board Scholastic Aptitude Test during the current year; the Committee on Admissions provides full information about the Scholastic Aptitude Tests;
3. by completing a special battery of tests in the Northeastern University Counseling and Testing Center, Room 302, Ell Student Center.

A transfer student applying for advanced standing need not complete testing.

In evaluating the credentials of applicants, the Committee on Admissions takes into account additional study which may have been completed since secondary school and, where relevant, armed forces experience.

Applying for Admission to the College of Engineering

Applications for freshman admission and admission with advanced standing may be obtained by writing to the Department of Admissions, 150 Richards Hall, or they may be secured during an admissions interview.

A personal interview is not required, but all candidates are welcome to make an appointment with an admissions counselor. Interviews may be scheduled from 8:30 a.m. to 4:00 p.m., Monday through Friday, and on Saturday from 9:00 to 11:30 a.m.

The candidate will be notified of the decision of the Committee on Admissions as soon as all credentials have been received and evaluated.

Candidates who have successfully completed courses at other institutions and who wish to transfer to Northeastern should read the following information concerning special transfer programs.

Civil and Electrical Engineering Transfer Programs for Associate Degree Graduates

Students with an Associate degree from an (ABET) accredited technical institute, community college, or junior college with a 2.5 cumulative average or

better ($C = 2.0$) will be considered for admission to a special transfer program and complete the civil or electrical engineering degree in five years. Students whose Associate degree program did not include a minimum of one year of both calculus and physics will not be eligible for entry at this level.

Civil, Electrical, and Mechanical Engineering Transfer Programs for Bachelor of Engineering Technology Graduates

Students with a Bachelor of Engineering Technology degree or its equivalent from an (ABET) accredited college or university, with a 2.75 cumulative average or better ($C = 2.0$), may be eligible to complete one of the specified Bachelor of Science in Engineering programs by taking a *minimum* of 40 quarter hours (10 courses) of work. The courses to be taken are assigned by a departmental adviser and are based whenever possible on the student's previous background. Students who have a Bachelor of Engineering Technology, Bachelor of Science in Engineering Technology, or a Bachelor of Science in Engineering degree that is not professionally accredited may be required to take significantly more courses.

All Other Transfers to the College of Engineering

Students with previous academic experience not covered in the above categories will be placed at an appropriate point in the program they select, based on a course-for-equivalent-course credit evaluation.

Questions concerning these programs may be referred to the Department of Admissions (437-2213), or to the Office of the Dean of the College of Engineering (437-2152).

The Academic Year

Each academic year is composed of four quarters, beginning late in September and ending early in September. Full details with regard to registration are mailed approximately one month in advance. The programs are offered only at the Boston Campus.

Schedule of Classes

Class will normally meet two evenings each week, and occasionally on Saturday morning. Laboratory classes meet during additional evenings.



admissions information

ADMISSION

The Student Body

The student body of Lincoln College is composed of recent high school graduates and mature men and women. Most students are employed in industry, with vocational experience ranging from very little for the recent secondary school graduate, to as much as 20 or 30 years for individuals seeking increased professional responsibility and status. Many technical career categories are represented—industrial, engineering, scientific, and allied-medical—demonstrating that, in our increasingly complex society, the key to personal advancement is education.

Northeastern University is authorized under Federal law to enroll non-immigrant alien students.

Academic Background

A firm knowledge of the fundamentals of mathematics and science is the foundation upon which successful achievements in the more advanced technological courses are built.

Applicants to Lincoln College are, in many cases, mature adults who, although they have experience in industry or previous education, have been away from formal study for some time, and therefore have doubts concerning their study habits and their algebra, geometry, and science proficiency. Those who anticipate some difficulty in adjusting to the first-year course requirements are advised to give very serious consideration to enrolling in noncredit courses in introductory mathematics, introductory physics, and/or introductory chemistry. These courses are designed to develop adequate background for the basic courses in the degree programs.

Program Counseling

Career planning through self-analysis and professional counseling assists students in planning educational programs appropriate to their objectives. Entering students are encouraged to arrange for personal interviews with Lincoln College program counselors for assistance in planning their academic programs. Counselors are available by appointment at the Huntington Avenue Campus, Boston, and at the other Lincoln College campuses listed at the front of this catalog. Students are encouraged to present records of prior education whenever possible. The effectiveness of the counseling review is greatly enhanced by this information. The University, through its Counseling and Testing

Center and its Career Information Center, is also prepared to assist applicants whose educational and vocational goals are more complex or less firmly defined.

Application for Admission

Information concerning admission may be obtained either by writing to Lincoln College or by requesting it at the time of visiting the College. The application for admission should be completed in detail and submitted to Lincoln College, Northeastern University, Boston, Massachusetts 02115.

All inquiries relative to the day cooperative programs should be referred to the Day College Admissions Office, 150 Richards Hall. (See pages 81 and 87.)

Mathematics Placement Test

Applicants requesting admission to regular first-year mathematics are required to demonstrate proficiency in introductory or basic mathematics through the Lincoln College Mathematics Placement Test. Students who request enrollment in the noncredit Introductory Mathematics course are not required to take the test. The Mathematics Placement Test will be administered during the registration period for each term of instruction at the Huntington Avenue campus, Boston, and the Suburban Campus, Burlington. The Mathematics Placement Test will be administered on selected dates at the Lincoln College campuses listed at the front of this catalog. In addition, the test is administered during the summer months. Contact the Lincoln College Office, 408 Churchill Hall, at the Boston Campus (437-2500).

Students who demonstrate satisfactory proficiency in the test will be permitted to register for the first-year courses in the program of their choice. To enroll in Engineering Physics (11.617) the student may need to take Introductory Physics.

If need for a strengthening of mathematical background is indicated, the applicant will be assigned to the Introductory Mathematics course.

Students enrolling in Introductory Mathematics may fill out their schedule by enrolling in Introductory Physics, Introductory Chemistry, or Engineering Graphics.

In every case the student should carefully consider the combined work and study load and register for only those courses which contribute to the development of a firm knowledge of fundamentals and which enable the student to adjust to academic study requirements.

CLASSIFICATION OF STUDENTS

Applicants who have filed an application for admission and who are approved by the Lincoln College Academic Standing Committee are admitted as regular students in the program which they have indicated on the application.

Special Students

Students having specific course needs, who do not desire a degree, may register for the courses if they have the required prerequisites or their equivalent. These students will be enrolled as "special students."

Matriculation

Petition forms of admission to the status of a degree candidate are available at offices on all Lincoln College campuses (see page 45). There are two methods of matriculation:

- A. Standard Method of Matriculation
 1. A student who has completed 16 quarter hours of credit in Lincoln College must file a matriculation petition to be recognized as a degree candidate.
 2. The student must have a high school diploma or its equivalent and must achieve a cumulative quality point average of 2.00 (an average of C) for all courses completed before filing the petition.
- B. Optional Method of Matriculation by Transfer Students
 1. A student who has transferred 16 quarter hours of credit from another accredited institution may file for matriculation following one quarter in residence in Lincoln College.
 2. A student who has completed 16 quarter hours of combined credit transferred from another accredited institution and earned at Lincoln College may file for matriculation..

All students filing for matriculation must have a high school diploma or its equivalent.

The Committee on Academic Standing may require a student to take one or more aptitude tests or interest tests if his or her credentials or academic record fail to give evidence of probable academic success. In this case, the student will be notified in writing that arrangements for testing should be made with the University Counseling and Testing Center. A fee is charged for these tests.

TRANSFER STUDENTS AND ADVANCED STANDING CREDITS

Students transferring from community colleges, junior colleges, technical institutes, or other colleges and universities may transfer applicable credits toward the degree requirements of Lincoln College.

Students admitted with transfer or advanced standing credits from another institution must meet the requirements for admission as set forth under the regulations applicable to regular students. Advanced standing in Lincoln College may be obtained by (1) transfer of credits or (2) proficiency examination.

Transfer of Credits

Subject to the approval of the Academic Standing Committee, credits may be awarded for academic work completed in other approved schools, colleges, or universities if the following criteria are met: (a) the content of the course being submitted is equivalent to that of the corresponding course in Lincoln College; (b) the average grade achieved in the course submitted is "C" or higher; and (c) the remoteness of the time of study does not negate its use as a prerequisite for an advanced course.

Applicants desiring advanced standing credit by transfer should indicate so at the time of filing the application for admission. The applicant should request the Registrar of the institutions of previous attendance to mail an official transcript to the Lincoln College Office.

Proficiency Examinations

Applicants who do not meet all the criteria for the normal transfer of credits, but who are able to supply evidence of sufficient knowledge of a subject as a result of previous training or experience, may petition the Academic Standing Committee for the privilege of taking a Proficiency Examination. If satisfactory proficiency is indicated by the examination, advanced standing credits may be awarded.

Readmission

Former students who seek readmission to continue a program of study after having withdrawn from the College for a period of time may be required to repeat courses which are prerequisites to advanced work.

REGISTRATION

Registration for Courses

Completion of admission requirements does not constitute official registration for courses. All students must be properly registered before attending classes. Registrations are processed by the Registrar's Office during the official registration periods. Former students should ascertain completion of prerequisite courses before registration. Students may register for full-year sequences of courses during the official registration periods. They are urged to register as early as possible in order to obtain the desired class schedule.

Changes in Registration

Changes in program should be initiated before the opening day of classes during the official registration periods.

Official Registration Periods

Official registration periods are scheduled before the Fall, Winter, Spring, and Summer Quarters during the academic year. Students are urged to register as early as possible during these periods. Dates of registration periods for each quarter are listed in the 1982-1984 Academic Calendar (see page 7).

Courses in Other Departments of the University

Lincoln College students assigned to courses in other departments of the University are charged the tuition rates and other fees effective in the departments in which they are enrolled.

academic information

ACADEMIC OPERATIONS

Campuses and Extensions

All courses are offered at the Huntington Avenue campus, Boston, with some courses available at the Suburban Campus, Burlington; Framingham North High School, Framingham; Norwood Junior High School North; Weymouth High Schools; and the Abraham Lincoln School in Revere; and for Aeronautical Technology students at the Suburban Campus, Burlington.

The Quarter Calendar

Northeastern University operates on a quarter-system calendar. All courses are evaluated in terms of quarter-hour credit. A quarter-hour credit is equal to three-fourths of a semester-hour credit.

Class Sessions

Classes at Northeastern are scheduled in different modules. In assessing quarter-hour weight for courses, the following statement applies. One quarter hour of credit is equal to approximately fifty minutes of instruction per week, plus two hours of preparation.

Course Work

All the usual methods of instruction are employed—lectures, home assignments, class projects, laboratory work, irregularly scheduled quizzes, and formal examinations. In addition, mid-course examinations are scheduled in most courses and a final examination is required at the completion of all courses. Students are responsible for fulfilling all the requirements of a course. In the event of absence, students must make appropriate arrangements for makeup with the instructor. Students must follow the procedures outlined below for makeup of missed mid-term or final examinations.

Student Study Areas

The University Library is well equipped with technical literature. A detailed statement about its facilities and hours appears on page 27.

Attendance

Students absent from regularly scheduled sessions in any subject, for whatever reason, may seriously jeopardize their academic progress and status. Students are expected to be in attendance at all the sessions scheduled in their

courses. Excessive absence may be sufficient cause for the Registrar to remove the subject(s) from the student's schedule.

Withdrawal

Simply ceasing to attend classes or notifying the instructor does not constitute official withdrawal from a course. To withdraw officially, the student must notify the Registrar's Office or complete the appropriate withdrawal form.

The Registrar will withdraw a student from a course who:

1. Does not attend the first three classes at the beginning of the quarter;
2. Does not attend the first two classes at the beginning of a summer term.

Family Educational Rights and Privacy Act

In accordance with the Family Educational Rights and Privacy Act of 1974, Northeastern University permits its students to inspect their records whenever appropriate and to challenge specific parts of them when they feel it necessary to do so. Specific details of the law as it applies to Northeastern are printed in the *Student Handbook* and are distributed annually during registration periods.

It is the policy of Northeastern University to deal with the student in all academic and administrative matters. If parents require any information regarding the progress of their son or daughter, they may contact the Dean of Students Office.

MAKEUP EXAMINATIONS

Mid-course Examinations

A student absent from a regularly scheduled mid-course examination or quiz may request permission to take a makeup examination. This is a privilege which may be denied if abused by an excessive number of petitions or for other reasons.

Students applying for makeup examinations must request from the instructor permission to take the mid-term examination or quiz. The instructor will forward the examination to the Lincoln College Office for processing.

Makeup mid-term examinations and quizzes will be given on a Saturday at 9:00 a.m. in a designated room at the Huntington Avenue campus according to the published schedule. Contact the Lincoln College Office, 408 Churchill Hall (Telephone 437-2500).

Any student who does not take the makeup examination as scheduled will forfeit the makeup privilege.

Missed Final Examinations

A student absent from a final examination will receive a grade of "I" (Incomplete) in the course. He or she may petition for a makeup final examination at the Registrar's Office, 120 Hayden Hall.

A student does not automatically have the right to make up a missed final examination. Students must petition for this privilege. If the petition is granted, the student must pay a \$10.00 fee for taking the special final examination. Petitions may be obtained from the Lincoln College Office or in each off-campus Administration Office. Petitions for missed finals must be filed in accordance with the published schedule. Contact the Lincoln College Office, 408 Churchill Hall (Telephone 437-2500).

Students will be notified by mail when and where to take the missed final examination. All examinations will be administered on the Boston campus. Those who do not take makeup final examinations as scheduled forfeit the makeup privilege.

ACADEMIC STANDARDS

The student is required to maintain appropriate levels of academic achievement in terms of grades, quality-point average, and the quantitative credit requirements of his or her program of study to satisfy academic progress criteria and achieve graduation from Lincoln College.

Grading System

The following system of grading is used. The numerical equivalent for each grade is in parentheses.

A	(4.000)–	Outstanding Attainment
A–	(3.667)–	
B+	(3.333)–	
B	(3.000)–	Good Attainment
B–	(2.667)–	
C+	(2.333)–	
C	(2.000)–	Satisfactory Attainment
C–	(1.667)–	
D+	(1.333)–	
D	(1.000)–	Poor Attainment
D–	(0.667)–	
F	(0.000)–	Failure
I	— —	Incomplete
L	— —	Audit (No Credit)
S	— —	Satisfactory achievement in a pass-fail course; counts toward total degree requirements
U	— —	Unsatisfactory achievement in a pass-fail course
X	— —	Incomplete in a pass-fail course
*	— —	Grade not received

A general average of "D" is unacceptable and will not allow a student to continue in Lincoln College or to receive a degree from Northeastern University. The "F" grade is a definite failure. The standard procedure for clearing failures

in courses offered in Lincoln College is to repeat the course. In some instances circumstances may warrant amending the standard procedure. These circumstances are described in the *Student Handbook* for day students. An "I" or "X" (incomplete) grade is used for a temporary grade to show that the student has not completed the course requirements.

Pass-Fail Courses

Any student who is not on academic probation and who has completed 40 quarter hours of academic work may register for one pass-fail course and, thereafter, for one course on a pass-fail basis for each 10 quarter hours of successfully completed work. Written permission of the appropriate academic dean must be obtained for each pass-fail course. At no time may a student register for more than one pass-fail course per quarter.

Such courses will be restricted to free electives outside the major field of specialization, so that no part of the specifically prescribed curricula will be affected.

The grades recorded on the basis of the pass-fail system of grading will not figure in the computation of the Q.P.A.

Auditing Policy

Students are permitted to audit courses upon filing the usual registration forms and paying the regular tuition fees. There is no reduction in fees for auditing. An auditor may participate in class discussion, complete papers and projects, and take tests and examinations for informal evaluation if desired. However, regardless of the amount or quality of work completed, **no academic credit will be granted at any time for courses audited.**

Audit Procedure

The student's decision to take a course on an audit basis must be communicated in writing to the Registrar prior to the fourth class meeting of the course. No exception to this procedure can be approved without authorization by the Academic Standing Committee of the College.

Grade Reports

Grades are mailed to the student by the Registrar and will not be given out at the office of either the Registrar or Lincoln College. Under no circumstances will grades be given over the telephone.

Quality-Point Average

The quality points earned by the student in a given course are determined on the basis of the letter grade achieved and the number of credit hours carried by the course. The total quality points earned, divided by the total number of credit hours, constitutes the quality-point average.

1. When the student has more than one grade in the same course, the most recent grade will be used in the calculation of the quality-point average.
2. A grade of "I" will not be considered in the calculation of the final quality-point average.
3. Although advanced standing credits (ASC) allowed for acceptable work completed at other institutions by transfer students count toward completion of the quantitative credit requirements, neither the credits nor the grades earned in such courses are included in quality-point average computations.
4. In programs made up of combined University College and Lincoln College courses, the cumulative quality-point average will include all work in both colleges.

For example, a student who has registered for 13 courses, cleared a failure in one of them, cleared an incomplete in another by repeating the course, and received advanced standing credit (ASC) in another, may calculate the quality-point average as follows:

Grade Achieved	Numerical Equivalent		Credit Hours		Quality Points
A	4.000	X	4	=	16.000
A-	3.667	X	3	=	11.001
B+	3.333	X	3	=	9.999
B	3.000	X	4	=	12.000
B-	2.667	X	2	=	5.334
C+	2.333	X	2	=	4.666
C	2.000	X	4	=	8.000
C-	1.667	X	3	=	5.001
D+	1.333	X	2	=	2.666
D	1.000	X	3	=	3.000
D-	0.667	X	2	=	1.334
F	0.000	X	2	=	0.000
FB	3.000	X	3	=	9.000
I	—	X	—	=	—
IC	2.000	X	2	=	4.000
ASC	—	X	—	=	—
		TOTALS	39		92.001

$$\text{Quality-Point Average} = \frac{\text{Total Quality Points (92.001)}}{\text{Total Credit Hours (39)}} = 2.359$$

The Registrar's Office will not be able to recalculate or confirm the calculations of quality-point averages for individual students. Each student's record will be brought up to date before graduation. In the meantime, borderline cases will be checked by the Lincoln College Academic Standing Committee.

Academic Progress Criteria

It is expected that the student will at all times endeavor to achieve a high record of achievement. The Academic Standing Committee reserves the right to review all students' records and deny readmission to those who fall below a minimum quality level of achievement. This requirement has been established as follows:

In order to be allowed to remain in the College, a student must have achieved a quality-point average of 1.4 at the completion of 24 quarter hours; 1.5 at the end of 48 quarter hours; and 1.6 at the end of 72 quarter hours.

It should be further noted that a student who accumulates the equivalent of six uncleared failures may be considered ineligible to continue the program of study.

Scholastic Probation

The Academic Standing Committee has the authority to dismiss from the College or place on scholastic probation any student whose scholarship is deficient for the following reasons: low quality-point average or excessive outstanding failures regardless of quality-point average.

A student on scholastic probation should be particularly diligent in current course work and make every effort to clear the academic deficiencies as soon as possible. Students whose academic records do not improve or whose failures are not properly cleared may not be allowed to register for further courses.

A student on scholastic probation who has cleared all or a substantial part of any outstanding failures may petition the Academic Standing Committee for removal from the probation list.

Disciplinary Probation

The Academic Standing Committee has the authority to dismiss from the College or place on disciplinary probation any student whom it may deem unworthy because of conduct or character. The Committee may ask any student to withdraw from the College who is obviously out of sympathy with its aims and ideals.

GRADUATION REQUIREMENTS

To receive the degree of Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology, the student must fulfill the following requirements:

1. Been formally accepted into "degree candidate" status by the Committee on Admissions;
2. Complete all the courses of the particular curriculum, either by attendance at Lincoln College or by receiving Advanced Standing Credit;
3. Complete Associate degree programs in eight years and Bachelor's programs in 12 years from the date of entrance into Lincoln College. Extensions of time may be granted by the Academic Standing Committee;

4. Be in attendance for at least a year preceding the expected graduation date; and complete at least one-fourth of the work in Lincoln College;
5. Achieve a quality-point average of at least 1.800 in courses taken in the College to be awarded the Associate in Engineering or Associate in Science degree. Achieve a quality-point average of at least 2.000 in all courses in their respective major and at least a 1.800 quality-point average overall for the Bachelor or Engineering Technology degree;
6. Pay the graduation fee of \$25.00.

In addition, students:

7. May not earn two Associate degrees or two Bachelor's degrees in the same field of academic specialization;
8. Must complete a minimum of 30 quarter hours of additional credits to be awarded more than one Associate or Bachelor's degree;
9. May not be awarded the Associate and Bachelor's degrees at the same commencement;
10. Must petition for transfer of credits completed at other institutions prior to January 1 of the year in which the degree is to be awarded.

ACADEMIC AND PROFESSIONAL AWARDS

The academic programs offered by Lincoln College and the teaching, counseling, and professional efforts of the faculty and staff are aimed at motivating the student toward the highest possible levels of academic achievement. To encourage scholarly and professional excellence and to recognize quality achievements, the following awards are made at appropriate times during the academic year:

Honor List and Dean's List Scholars

Students maintaining honor grade averages—minimum quality average of 3.000 and no "D" grades—during a quarter while carrying a minimum of 6 quarter hours credit are recognized as Dean's List Scholars. Students desiring certificates attesting to this honor should request them from the Lincoln College Office.

Scholastic Achievement Certificates

Upon graduation with an Associate degree, Scholastic Achievement Certificates will be awarded to those students who have achieved distinctly superior attainment in the academic work as follows:

Scholastic Achievement	3.000-3.499 Q.P.A.
High Scholastic Achievement	3.500-3.749 Q.P.A.
Highest Scholastic Achievement	3.750-4.000 Q.P.A.

In order to be eligible for a Scholastic Achievement Certificate, the student must earn a minimum of 48 quarter hours of credit in Lincoln College.

Graduation with Honor

Upon graduation, honors will be conferred upon students who have achieved distinctly superior academic achievement in a program leading to the Baccalaureate degree as follows:

Honor	3.000-3.499 Q.P.A.
High Honor	3.500-3.749 Q.P.A.
Highest Honor	3.750-4.000 Q.P.A.

In order to be eligible for Honors, the student must earn a minimum of 72 quarter hours credit in Lincoln College and receive a vote of approval from the faculty with responsibility for the program.

University Awards

The University Awards are presented annually to seniors who have achieved high ranking cumulative academic records. Certificates are awarded at the Annual Class Day ceremony.

Technology Awards

The Technology Awards are presented annually to seniors who have demonstrated superior academic and professional capabilities in their special career fields. Appropriate certificates are distributed to outstanding students enrolled in the following program categories:

Civil Engineering Technology
Electrical Engineering Technology
Mechanical Engineering Technology
Computer Technology

Class Marshal Award

The Class Marshal Award is presented annually at the Class Day Banquet for Graduates to the top ranking senior in a baccalaureate program. The award consists of an appropriate certificate and the President's Letter of Commendation.

Sigma Epsilon Rho Awards

Sigma Epsilon Rho, the evening colleges' scholastic honor fraternity, annually awards plaques and scholarships for outstanding scholastic achievement to the highest ranking students in University and Lincoln Colleges at the end of their junior year.

Sigma Epsilon Rho Honor Society Scholarship Award

The Sigma Epsilon Rho Honor Society Scholarship Award, established in 1974 by the membership of the Society, is awarded annually to a student of University and/or Lincoln College. Eligible students must have a cumulative

quality point average of 3.0 or better after completing 80 percent or more of their required studies.

Alumni Award for Professional Promise

Established in 1947 by the Northeastern University Alumni Association, the Alumni Award for Professional Promise is presented annually at a final senior class meeting in the spring of the year. The award is made to the senior who has demonstrated unusual professional promise through character traits, scholastic achievement, and work performance.

Leslie B. Cutler Aviation Awards

The Leslie B. Cutler Aviation Awards were established by the members of the Aero Club of New England to honor and give recognition to the late Senator Cutler's service and devotion to the interests of aviation in the Massachusetts General Court, national legislative bodies, and her private life. These scholarship awards are made to students in the Commercial Aeronautical Technology Program who most typify the same interest, devotion, and leadership demonstrated by Senator Cutler during her long and distinguished public career.

Mark Caldwell Whitney Memorial Aviation Scholarship Fund

This Fund was established in 1981 by the family and friends of the late Mark Caldwell Whitney, an outstanding 1973 graduate of the Aeronautical Technology Program. Income from the Fund will be awarded annually to a student with financial need who exemplifies Mr. Whitney's love of flying and commitment to excellence in the aviation field.



financial information

Tuition rates, all fees, rules and regulations, courses and course content are subject to revision by the President and the Board of Trustees at any time.

TUITION

Initial Registration Fee

A nonrefundable \$10.00 registration fee, required of all new students, is due and payable upon registration.

Tuition

Tuition for all part-time evening courses offered for 1982–1983 is \$75.00 per quarter hour of credit. Tuition for Day B.E.T. students will be based on the current day school rate. Charges for registration and tuition for special courses are at the rate specified for each course. Students are permitted to audit courses; however, there is no reduction in fees for auditing.

Students are not permitted to attend class sessions or take any examination or test until they have paid their tuition fees or have made satisfactory arrangements for payment.

Students will not be advanced in class standing, nor permitted to reenroll in the University, nor have degrees conferred, until all financial obligations to the University have been met.

No certificate of honorable dismissal will be issued to any student who has not fully met his or her financial obligations to the University.

Noncredit courses are charged at quarter-hour rates equal to those of credit courses meeting on an equivalent contact-hour schedule.

Courses in Other Departments of the University

Students assigned to courses in other departments or colleges of the University are charged the tuition rates and other fees effective in the departments in which they are enrolled.

Aeronautical Technology Tuition (Day Program)

The amount of flight instruction required by each aeronautical technology student is not fixed. Since each student progresses at his or her own pace, exact tuition quotes cannot be made for the complete program. Students will be free to negotiate the flight tuition with the several flight schools approved by the University.

Day Program Tuition Deposit

Applicants accepted for admission to the day program must upon request pay a nonreturnable tuition deposit of \$100 as evidence of their intention to enroll; this will be applied to their first tuition payment.

Tuition for all courses is charged on a quarter basis and is payable in full at the beginning of each quarter.

Deferred-Payment Privilege

Occasionally situations develop, usually beyond the control of the student, which make it difficult to meet payments in the regular manner. Under such circumstances, the student is advised to discuss the problem personally with the Bursar's Office, where a convenient deferred-payment agreement can be worked out. A service fee of \$5.00 is charged for this privilege.

Late Payment Fee

Payments of tuition are due by Saturday of the week in which the bill is dated. If payment, or a deferred-payment agreement, is not arranged by that date, a late fee of \$50 is charged by the Bursar.

Refund of Tuition

The general policy in all schools and colleges of the University with respect to refunds of tuition to students is as follows:

The University provides all instruction on an academic quarter basis for which students pay at the beginning of each quarter. Tuition refunds will be granted through the first four weeks of a quarter only when specified conditions are met. Questions regarding refunds should be discussed with the Bursar.

Tuition refunds will be granted only on the basis of the date appearing on the official withdrawal application when filed with the Registrar in Room 120 Hayden Hall. Nonattendance does not constitute official withdrawal.

Refunds will be granted in accordance with the following schedule:

Official withdrawal filed within:	Percentage of tuition
1st week of quarter	100%
2nd week of quarter	75%
3rd week of quarter	50%
4th week of quarter	25%

Tuition Underwritten by Employers

An increasing number of companies are underwriting part or all of the cost of tuition of students in their employ. In cases in which payment is made directly by the employer to the University, the student should furnish the Bursar's Office a purchase order covering the registration or a statement from an officer of his or her company certifying that the company is underwriting the tuition.

Student Bursar

All inquiries about student accounts should be directed to the Student Account Bursar, 437-2270.

Veterans' Benefits

Veterans' benefits depend on course load and increase sharply when a student's program exceeds eight quarter hours per quarter. Questions and applications should be directed to Room 116 Hayden Hall, Telephone 437-2283.

SPECIAL FEES**International Student Fee**

New undergraduate international students are charged a \$200 fee, payable, one time only, upon admission to the University.

Student Center Fee

Students attending the Huntington Avenue campus, Boston, in the evening in a part-time program of study will be assessed a Student Center Fee of 75¢ per quarter.

Health Service Fee

Students attending the Boston, full-time Day cooperative B.E.T. programs are required to pay a Health Service Fee of \$220. The program is available to Aeronautical Technology students on an optional basis.

Missed Final Examination Fee

Students absent from the regularly scheduled final examination at the end of a course may petition for a "special final examination." The fee for each examination requested by the student is \$10.00. The fee must be paid when the petition is filed in the Lincoln College Office.

Proficiency Examination Fee

Applicants for admission may petition to be awarded advanced standing on the basis of achievement demonstrated by a "proficiency examination." The fee for each examination requested by the applicant is \$25.00. The fee must be paid when the petition is filed in the Lincoln College Office.

Graduation Fee

The University graduation fee, charged to candidates for the Associate or Bachelor's degree, is \$25.00, payable on or before May 1 of the year in which the student expects to graduate.

Transcript of Record Fee

Students may request transcripts of their records at the University Registrar's Office. There is no charge for the first transcript. After the initial transcript there is a charge of \$2.00 per copy, payable in advance.

TEXTBOOKS AND SUPPLIES

Students purchase their own textbooks and work materials. The cost varies according to the subject for which the student is enrolled. The average cost for a normal program of four subjects generally ranges from \$50.00 to \$100.00. Textbooks for single courses range from \$10.00 to \$40.00.

Students enrolled in Engineering Graphics should be prepared to spend \$25.00 to \$35.00 for drawing supplies and \$15.00 to \$25.00 for a set of drawing instruments in addition to the textbooks.

LOAN PROGRAMS

Full-time students in Lincoln College who are pursuing the B.E.T. Program should refer to the Undergraduate Catalog for financial aid information.

FINANCIAL AID

The Office of Financial Aid, located in 254 Richards Hall, offers several types of assistance to part-time students. All awards are based on financial need. Aid granted from programs sponsored by the Federal government is dependent upon the amount of funding allocated to Northeastern University.

Basic Educational Opportunity Grants (BEOG)

The Basic Educational Opportunity Grant program is a Federal aid program designed to provide financial assistance to those who need it to attend post-high school educational institutions. Basic Grants are intended to be the "floor" of a financial aid package and may be combined with other forms of aid in order to meet the full costs of education. BEOG is a grant and, unlike a loan, does not have to be repaid. Half-time students taking at least 6 credit hours each quarter may apply. Awards range up to one-half the maximum allowable by law, contingent upon the total cost of education. Applications are available in the Office of Financial Aid, 254 Richards Hall, or by writing to BEOG, Post Office Box 84, Washington, D.C. 20044.

National Direct Student Loan

This program is available to students who are carrying at least one-half the normal academic workload, are accepted as degree candidates, i.e., have 16 credit hours and a matriculation certificate, and who show evidence of financial need.

Direct Loans are available to students who present evidence of needing financial assistance. Undergraduate students may borrow up to a maximum of

\$3,000 for the first two years, or a total of \$6,000 for their entire undergraduate education. Students are allowed a total maximum of \$12,000 through their undergraduate and graduate education. Repayment and interest on Direct Loans are not required until six months after a student graduates or withdraws from the institution. Repayment of principal may be extended over a 10-year period, with the interest rate of 5% per annum. Repayment may be deferred up to a total of three years if the student is pursuing at least a half-time course of study or serving in the Peace Corps, VISTA, or the armed forces.

Community Sources

Students and their families are urged to explore community, industrial, and foundation sources for collegiate financial aid. Parental employers or the appropriate union organization may be a source. In addition, local, civic, political, religious, or educational leaders are often aware of aid sources in the immediate community. Some typical sources may include: P.T.A., Kiwanis, Lions, Elks, Knights of Columbus, Masons, Sons of Italy, Rotary, State Rehabilitation, American Legion, and similar groups or organizations.

University Grants

Each year Northeastern University grants a substantial number of full and partial tuition grants to students who have demonstrated both above-average scholastic achievement and financial need. All applications for aid are automatically considered for all grants administered by the University. It is not necessary for an applicant to specify the grant in which he or she is interested.

Veterans' Benefits

Any veteran covered by the Veterans Readjustment Act of 1966, Public Law 89-358, should report to Room 116 Hayden Hall to fill out the proper enrollment forms. These forms will be made available during registration periods for all students in the Law Enforcement programs at special off-campus locations.

Students needing additional information as to eligibility, allowances, or other details are urged to contact their local office of the Veterans Administration as early as possible.

Guaranteed Student Loan Program

Under this program, students who are matriculated degree candidates, enrolled for at least one-half the normal academic work load, may borrow from a participating bank or other financial institution. Terms and conditions vary from state to state, but a student generally may borrow up to \$2,000 a year (the law allows a maximum of \$2,500 per year) depending on financial need. The Federal government pays the interest while the student is in school if the student is eligible for interest subsidy.

Applications for this loan are available from local banks or the Education Office of your state government. Additional information is available from the Financial Aid Office.

Martin Luther King, Jr. Scholarships

These scholarships were established in 1969 in memory of the late Rev. Martin Luther King, Jr. Awards are made as openings occur to adults from minority groups who would otherwise be unable to continue their education. Stipends will cover tuition expenses not to exceed 6 quarter hours in any academic quarter (excluding the Summer Quarter).

H. Patricia Taylor Scholarship Fund

The H. Patricia Taylor Scholarship Fund was established in 1974 by H. Patricia Taylor, a graduate of University College, and her husband, Harry C. Taylor, a graduate of the School of Business. The Scholarship expresses their appreciation for financial assistance made available to Mrs. Taylor while obtaining her degree, and is an attempt to provide similar funds to assist others in realizing their potential through higher education. The income from the Scholarship Fund will be awarded annually to a student enrolled in University College or Lincoln College who demonstrates financial need and academic stability and who meets certain other conditions of eligibility.

Robert G. Keene Memorial Scholarship Fund

This Fund was established in 1979 in memory of Robert G. Keene, a graduate of Lincoln College, Class of 1972. The endowment funds were provided by the friends and associates of Robert G. Keene and the Polaroid Corporation, where he served as an Engineering Manager. The income from the Fund will be awarded annually to an undergraduate student in any College of the University who demonstrates financial need as well as strong character and initiative. Primary consideration will be given to children of Polaroid employees.

student activities and alumni information

Evening Student Council

The Evening Student Council (E.S.C.) was formed to provide a representative body to promote the welfare of the student body in nonacademic areas and to foster extracurricular activities which will enrich University life. It affords participants opportunities to meet and develop close personal relationships with fellow students and administrative staff.

The Evening Student Council provides students with opportunities to develop leadership skills and gives them a chance to discuss matters of professional interest with experts in their chosen field.

The Council is made up of interested students in University and Lincoln Colleges, representatives of part-time interest groups, and those specially certified by the Council because of their demonstrated interest in the overall adult programs of the University.

The E.S.C., a member of the United States Association of Evening Student Councils, meets evenings on a monthly basis. Students are welcome to visit, observe, and express opinions concerning evening student life.

Social and Professional Clubs

Student activities for part-time students are planned, organized, and operated by the student body with the assistance of the Director of University-Lincoln College Student Activities. The programs are designed to keep pace with the changing needs of adult students and to provide maximum opportunity for student participation. All part-time students in University College and Lincoln College are welcome to participate.

The program is flexible in nature and pioneering in spirit to meet the needs of adult students. The Office of University-Lincoln College Student Activities is particularly interested in developing new clubs which will benefit students professionally and educationally. If students wish to start clubs related to their professions, this office will help them plan and organize on the local and national levels. The program is dedicated to assisting the adult student in the development of his or her fullest potential. The University-Lincoln College Student Activities Office is located in 102 Churchill Hall.

Use of Gymnasium Facilities

Specific schedules for use of the pool, weight training room, indoor athletic field and track, gymnasium, and wrestling room are set up each quarter for use by all part-time students. In order to become eligible, students must obtain a temporary gymnasium pass each time they wish to use the Cabot Gymnasium

complex. Passes are available in Cabot, Room 111, Monday through Friday from 4:30 p.m. to 9:30 p.m., and on Saturday and Sunday during all open hours. All students requesting a pass must present their Student Identification Card. Students using the Cabot Gymnasium complex are required to abide by all the rules of the gym and may be asked to complete a Medical Release Form. Revised schedules for holiday periods will be posted.

Alpha Eta Rho

The Nu Epsilon Chapter of this international aviation fraternity is a social organization open to all Aeronautical Technology students. It is organized to actively associate the interested students of aviation with leaders and executives in the industry. This close association, strengthened through the bonds of an international aviation fraternity, establishes opportunities for members in their relation to aviation and inspires interest and cooperation among those in the profession who are also members of Alpha Eta Rho.

Alumni Association

More than 86,000 alumni are members of the all-University Alumni Association, which has as its prime purposes the promotion of the welfare of Northeastern University, the establishment of a mutually beneficial relationship between the University and its alumni, and the perpetuation of fellowship among members of the Association.

The Association headquarters are located in 310 Churchill Hall. The official records and addresses of alumni are maintained at 236 Huntington Avenue.

Activities of the Association, including the Homecoming Day celebration and the annual presentation of Professional Promise Awards to outstanding seniors in each of the colleges, are directed by the Vice President for Alumni Affairs. Alumni officers also attend meetings of undergraduate classes to form a closer relationship between the Association and its future members.

The Alumni Relations Office assists the various class officers in planning class reunions. Each class normally holds a reunion every five years during the month of June. The Vice President for the Alumni Class Council is responsible for coordinating class activities and organizing class functions.

The Vice President for Alumni Clubs works in close association with officers of the more than 50 Regional Alumni Clubs which have been established from coast to coast. All alumni are eligible to become members of these organizations. The alumni clubs meet periodically, often in conjunction with visits from members of the faculty or with athletic events.

For Boston area alumni, monthly luncheon meetings are held in both the downtown and uptown sections of the city.

The Association also sponsors and assists the alumnae organization and the Varsity Club, both of which have their own officers and conduct various programs throughout the year. Through the Varsity Club, the Association presents trophies to the outstanding athlete of the year in each of the six major sports.

One of the most recent developments in alumni activities is the organization of seminars, which are conducted by the Association in cooperation with the University's Center for Continuing Education. The seminars are designed particularly for alumni who have a special interest in current events and the field of adult education.

The Northeastern University Alumni Association is a member of the American Alumni Council, a professional organization composed of representatives of all major colleges and universities in the United States and Canada.

Alumni Relations

The Alumni Association is providing a uniquely valuable service to both the University and the community by sponsoring admissions conferences for parents of high school students who are interested in attending college. These meetings, held in cooperation with the Northeastern Department of Admissions, have been extremely well attended. Local residents as well as alumni of the University have been invited to these conferences, which help to clarify many of the questions today's parents and young people have concerning application procedures of colleges and universities.

Placement Service

Many requests from employers are received by the College for men and women of potential ability to fill important positions of responsibility. It is the policy of the College to serve the students whenever possible by placing them in those positions which promise attractive opportunities for development and advancement. The College cannot guarantee to place its students, but it does endeavor to keep in close touch with those who desire placement service and to assist them in obtaining satisfactory advancement in position and income. No charge is made for placement service. Those needing this assistance should arrange an appointment with the Director of Placement.

While the College cannot guarantee positions to its graduates, the number of requests usually exceeds the number available in the graduating class of any given year. The policy of the College is to find the best qualified men and women among its graduates for the positions which the College is called upon to fill.

The College, in recommending a graduate for a position, furnishes the prospective employer with the facts as to the graduate's ability, character, attitudes, habits, and other qualifications for the position as revealed by the College records. In the last analysis, however, placement in a position depends largely upon the graduate's ability to sell his or her services to the prospective employer. Most employers prefer to consider two or more candidates for a position and generally ask the College to suggest more than one person. Many manufacturing and commercial firms throughout New England call upon the College to assist them in filling important executive and managerial positions.



academic programs of instruction

SCOPE OF PROGRAMMING

Lincoln College, either by itself or in collaboration with University College, conducts educational programs at the undergraduate level in the following areas of technology:

- Pre-Technology Preparation
- Aeronautical Technology
- Civil Engineering Technology
- Electrical Engineering Technology
- Mechanical Engineering Technology
- Computer Technology

Program Selection

Students should be sure that the program they desire is offered in a suitable time period. Most programs are offered in the evening on a part-time basis. However, Aeronautical Technology is offered only on a full-time day basis.

In the fields of Electrical Engineering Technology and Mechanical Engineering Technology, full-time day cooperative programs were established in the fall of 1971. Students may enter as freshmen or transfer with advanced standing by applying to the Office of Admissions, Northeastern University, 150 Richards Hall.

Degrees and Certificates

Lincoln College conducts education programs on the undergraduate level in various technological areas leading to the following degrees and certificates:

1. Associate in Science degree (A.S.) requiring 96 to 105 quarter hours of credit;
2. Associate in Engineering degree (A.E.) requiring 96 to 103 quarter hours of credit;
3. Bachelor of Engineering Technology degree (B.E.T.) requiring 180 to 183 quarter hours of credit.

Most courses are available for special students.

Opportunities for Associate Degree Graduates

Graduates of the Engineering or Science Technology Programs in Lincoln College, or other similar colleges and institutions, who have earned the Associate in Engineering or the Associate in Science degree, may transfer ap-

plicable credits toward the degree requirements in the baccalaureate programs in Engineering Technology, Medical Technology, or Industrial Technology.

Those who have maintained a quality-point average of 2.75 or higher in the Associate degree programs may apply for transfer to either of the following College of Engineering curricula: (1) day college cooperative education programs in Civil, Mechanical, Electrical, or Industrial Engineering with credit for up to two years of the five-year program; or (2) the part-time evening programs in Civil, Electrical, or Mechanical Engineering with credit for the first three years of the eight-year programs.

PRE-TECHNOLOGY PREPARATION

(Noncredit)

Beginning students who have been away from formal study for some time are frequently concerned about their study habits and their verbal, mathematical, and scientific backgrounds. Applicants who anticipate some problems should give serious consideration to enrolling in the noncredit introductory courses, the Reading Improvement Program, or doing review work through programmed instruction at the Learning Center.

Introductory Courses

These courses offer the student the opportunity to develop background for basic courses in the degree programs and thus increase the probability of successful achievement in advanced technology courses.

Introductory Mathematics I and II

A two-quarter review of high school algebra and some plane geometry designed to prepare students for the course 10.607 College Algebra and Trigonometry I. These courses are required of students who do not demonstrate sufficient algebra proficiency on the Mathematics Placement Test. (See course descriptions for 10.681 and 10.682, page 125.)

Introductory Physics I and II

A two-quarter, relatively nonmathematical introduction to the concepts of physics designed to allow students to prepare themselves for the courses 11.617 Physics I or 11.604 General Physics I. (See course descriptions for 11.681 and 11.682, page 127.)

Basic Mathematics I and II

A two-quarter review of basic algebra offers students the opportunity to prepare themselves for the course 10.627 Mathematics I. These courses are required of students who do not demonstrate sufficient proficiency in algebra on the Mathematics Placement Test. (See course descriptions for 10.671 and 10.672, page 125.)

English for International Students I, II, III

A three-quarter, noncredit sequence for foreign-speaking students covering introduction to English grammar, with emphasis on listening, speaking, and writing; selected readings and exercises to strengthen vocabulary and pronunciation; preparation of written and oral reports, business and social correspondence; and advanced work in written and spoken English preparatory to entering 30.305 English I.

Reading Improvement

The ability to read well is one of the most important basic tools for the successful completion of a college program. The University's Center for Reading Improvement gives the student an opportunity to develop good reading habits in preparation for the intensive reading assignments of college-level courses. The following core skills are covered: previewing, locating main ideas and related details, using guide words and phrases, identifying structural patterns, outlining and summarizing, note-taking, vocabulary building, skimming and scanning, speed-reading, and critical reading. Further information may be obtained at the Center for Reading Improvement.

Programmed Study

Students may enroll in noncredit, self-study courses to better prepare themselves for college academic work and strengthen their high school background at the University's Learning Center, 406 Dodge, Tel. 437-2465.

Courses which may be useful to students in the Lincoln College programs in technology are: slide rule, trigonometry, effective listening, spelling, algebra, study skills, calculus, and English.

University Learning Center hours:

Monday, Tuesday, Wednesday, Thursday—8:00 a.m.-8:00 p.m.

(Thursday—closed 12:50 p.m.-1:50 p.m.)

Friday—8:00 a.m.-7:00 p.m.

Saturday, Sunday—1:00 p.m.-5:00 p.m.

AERONAUTICAL TECHNOLOGY PROGRAM

The Aeronautical Technology Program offered by Lincoln College through its Federal Aviation Administration Approved Pilot Ground School offers exposure to the scientific, technological, and business backgrounds required by the modern commercial pilot or entrepreneur in today's aviation and aerospace world as it operates within the framework of the total ship-rail-motor-aircraft transportation industry.

The tremendous expansion of aviation as an increasingly important sector of the nation's industrial economy has accelerated the demand for appropriately trained and educated personnel for careers related to the flight, instructional, regulatory, management, and technical aspects of the aviation industry.

Flight opportunities range from pilot or co-pilot in the single- or multi-engine air-taxi and cargo services of the feeder airlines or private company to flight engineer, first officer, or captain in the high-speed, multi-jet-engined services of the national and international systems of the major airlines.

The education-training-regulation sector of the aviation industry provides additional career opportunities as flight, ground, or simulator instructors or as flight examiners, training or safety directors, and supervisors in the licensing and regulatory agencies of local, state, or Federal government.

Persons knowledgeable in the technology and regulations of aviation, who are also skillful in dealing with people, may pursue challenging and rewarding careers in aviation sales, airport operations, aviation business management, or related areas.

The Aeronautical Technology-related program, presently offered by Lincoln College, is a two-year full-time day program which leads to an Associate in Science degree.

This program is conducted at the Suburban Campus in Burlington, Massachusetts, and local air fields. Aeronautical students at Northeastern University need their own transportation, since there are no dormitories on this campus.

Aeronautical Technology

Major Code 096

Leading to the Degree of Associate in Science (Day Program—2 Years)

The curriculum of the Aeronautical Technology program offers students the opportunity to prepare themselves in the shortest reasonable time to assimilate the required amount of related academic instruction and accumulated flight time for certification with the Private and Commercial Instrument Ratings by the Federal Aviation Administration.

Prerequisites: An applicant for admission to the Aeronautical program should have completed a minimum of algebra I and II and geometry. The student must have a high school diploma or its equivalent. The flight student will be required to obtain the F.A.A. Class I or II medical certificate. All candidates for admission must have an interview with the Aeronautical program counselor.

Fall	Winter	Spring	First Year	Q.H.
Course Number				
10.607	10.608		College Algebra & Trigonometry I, II	8
		10.620*	Calculus I	4
11.617	11.618	11.619	Physics I, II, III	12
30.305	30.306		English I, II	6
		93.401	Technical Communications	4
96.404			Fundamentals of Aeronautics	4
	96.437		Advanced Aeronautics	4
		96.444	Meteorology & Climatology	4

*Optional

Second Year

96.308			Aircraft Power Plants & Systems	4
	96.324	96.325	Introductory Avionics, Avionics	8
96.418			Intermodal Transportation	4
	48.314		Air Transportation	3
		96.420	Airline Traffic & Sales	4
96.417			General Aviation Operations	4
	41.301	41.302	Accounting Principles I, II	6
96.438			Instrument Procedures	4
	96.410		Aviation History I	4
		()	Aeronautical Elective	4

Professional Pilot Program (Flight)

96.334		Private Flight Lab.	4	
	96.439	Advanced Flight Lab.	4	
		96.339	Instrument Flight Lab.	4

Total A.S. Degree 103

With the approval of their adviser, students following the professional pilot track will satisfy the program flight training requirements at Northeastern University recommended flight schools. These students will be required to make individual arrangements for their flight training and will be awarded credit based on the successful completion of the rating being sought.

Second Year (Non-Flight Option)

Students electing the Non-Flight Option will replace the commercial flight courses with a sequence of air transportation, law enforcement, engineering, or airport management courses. These courses are listed under the description of courses at the end of the catalog.

Students having definite plans to enter other upperclass programs following the completion of the Associate degree should consult their adviser regarding entrance requirements prior to registering for second-year courses.

Students completing the Associate and Bachelor's programs may acquire the scientific, technological, and business background for employment in a variety of positions, including: Flight Crew Officers, Airport Management, Fixed Base Operations, Air Transportation, Aviation Sales, F.A.A. positions, and others.

Notwithstanding any of the other Aeronautical program requirements, each student must satisfactorily complete 96 quarter hours of course work to be eligible for the Associate degree.

**Certificate of Advanced Study in
Aeronautical Technology**

The Certificate of Advanced Study in Aeronautical Technology will be awarded to students who satisfactorily complete 48 quarter hours of course work beyond the Associate degree.

Course programs will be arranged to enhance the student's individual career objectives and will consist of advanced aeronautical courses, engineering technology, or science courses.

Prerequisite: Associate degree in Aeronautical Engineering or equivalent.

CIVIL ENGINEERING TECHNOLOGY PROGRAMS

Civil Engineering deals with the planning and construction of all kinds of relatively permanent structures and public works. Its major functions are: the preparation of surveys (topographical, geological, traffic, utility, etc.); the design of structures (buildings, bridges, dams, harbor facilities, etc.); the planning of municipal systems (water, sanitary, gas, flood control, air pollution control, etc.); and the development of transportation facilities (highway, railway, waterway, airway, etc.).

In performing these functions, the civil engineer usually works in close association with professionals in the field and may develop technologically to function independently and in positions of managerial responsibility.

Employment opportunities for Civil Engineering Technology program graduates are with town, city, state, or Federal public works departments and agencies; private consulting, engineering, architectural, and construction organizations; and with railroads and the military. Job opportunities will also depend upon the economy and the abilities of the individual.

The Civil Engineering Technology program and related programs offered by Lincoln College are:

Associate in Engineering Degree

Architectural Engineering Technology	page 70
Environmental Engineering Technology	page 71
Structural Engineering Technology	page 72
Surveying and Highway Engineering Technology	page 74

Bachelor of Engineering Technology Degree

Civil Engineering Technology	page 75
Mechanical-Structural Engineering Technology	page 92

Architectural Engineering Technology

Major Code 025

Leading to the Degree of Associate in Engineering

The program in Architectural Engineering Technology offers students the opportunity to prepare to assume responsibilities in the planning, design, and construction of buildings. Employment opportunities are with architectural groups, consulting engineering firms, and government agencies. Job opportunities will also depend upon the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or Introductory Mathematics I and II courses (10.681 and 10.682). The Mathematics Placement Test must be taken prior to registration.

Each student in English I (30.305) will take a Placement Examination during class. Some students may be requested to register for Elements of Writing (30.304), a 3 q.h. course designed to upgrade the student's background.

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Fall	Winter	Spring	First Year	
Course Number				Q.H.
10.607			College Algebra	4
	10.608		Introduction to Calculus	4
		10.620	Calculus I	4
09.670	09.671		Engineering Graphics I, II	8
		09.600	Computer Programming for Eng. Tech.	4
Second Year				
11.617	11.618	11.619	Physics I, II, III	12
	30.305		English I	3
		93.606	Technical Communications I	3
10.621			Calculus A	4
	11.673	11.674	Physics Laboratory I, II	4
Third Year				
12.444			General Chemistry I	3
	30.306		English II	3
		01.621	Introduction to Structural Design	4
02.611			Mechanics A	4
	02.614	02.615	Stress Analysis A, B	8
39.301	39.302		Economics Principles and Problems I, II	6
Fourth Year				
01.624			Structural Analysis I	4
	01.691	01.692	Architectural Design I, II*	8
01.690			Technology of Modern Architecture	4
	01.671		Concrete Design I	4
		01.631	Steel Design I	4
Total A.E. Degree				102

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Environmental Engineering Technology

Major Code 011

Leading to the Degree of Associate in Engineering

The program in Environmental Engineering Technology offers the student the opportunity to prepare to assume responsibilities related to the design, construction, operation, and supervision of municipal plants and systems concerned with the storage and distribution of water, and also the disposal of sewage and waste in urban areas with strong considerations regarding contamination and pollution. Employment opportunities are with town, city, and state public works departments, private engineering consultants, archi-

*27.541, 27.542, 27.543 Drawing I, II, III (*Prereq. none*)—a basic drawing course in developing pencil, pen, and wash techniques; and the study of basic drawing problems using a variety of media—may be used to supplement this program.

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tects, contractors, and many other engineering organizations. Job opportunities will also depend upon the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.681 and 10.682). The Mathematics Placement Test must be taken prior to registration.

Each student in English I (30.305) will take a Placement Examination during class. Some students may be requested to register for Elements of Writing (30.304), a 3 q.h. course designed to upgrade the student's background.

Fall	Winter	Spring	First Year	Q.H.
Course Number				
10.607			College Algebra	4
	10.608		Introduction to Calculus	4
		10.620	Calculus I	4
09.670	09.671		Engineering Graphics I, II	8
		09.600	Computer Programming for Eng. Tech.	4
Second Year				
11.617	11.618	11.619	Physics I, II, III	12
	30.305		English I	3
		93.606	Technical Communications I	3
10.621			Calculus A	4
	11.673	11.674	Physics Laboratory I, II	4
Third Year				
12.444			General Chemistry I	3
	30.306		English II	3
		01.641	Fluid Mechanics	4
02.611			Mechanics A	4
	02.614	02.615	Stress Analysis A, B	8
39.301	39.302		Economic Principles and Problems I, II	6
Fourth Year				
01.624			Structural Analysis I	4
	01.650		Environmental Engineering I	4
		01.693	Construction Administration	4
01.661			Materials and Soil Mechanics	4
	01.671		Concrete Design I	4
		01.651	Environmental Engineering II	4
Total A.E. Degree				102

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Structural Engineering Technology

Major Code 012

Leading to the Degree of Associate in Engineering

The program in Structural Engineering Technology offers the student the opportunity to prepare to assume responsibilities related to the planning, design, and supervision of

the construction of buildings, bridges, foundations; flood-control projects, and all fixed structures. Employment opportunities are with consulting engineering firms, architectural groups, contractors, railroads, government agencies, the military, and other design-related companies. Job opportunities will also depend upon the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.681 and 10.682). The Mathematics Placement Test must be taken prior to registration.

Each student in English I (30.305) will take a Placement Examination during class. Some students may be requested to register for Elements of Writing (30.304), a 3 q.h. course designed to upgrade the student's background.

Fall	Winter	Spring	First Year	
Course Number				Q.H.
10.607			College Algebra	4
	10.608		Introduction to Calculus	4
		10.620	Calculus I	4
09.670	09.671		Engineering Graphics I, II	8
		09.600	Computer Programming for Eng. Tech.	4
Second Year				
11.617	11.618	11.619	Physics I, II, III	12
	30.305		English I	3
		93.606	Technical Communications I	3
10.621			Calculus A	4
	11.673	11.674	Physics Laboratory I, II	4
Third Year				
12.444			General Chemistry I	3
	30.306		English II	3
		01.621	Introduction to Structural Design	4
02.611			Mechanics A	4
	02.614	02.615	Stress Analysis A, B	8
39.301	39.302		Economic Principles and Problems I, II	6
Fourth Year				
01.624	01.625		Structural Analysis I, II	8
		01.693	Construction Administration	4
01.661			Materials and Soil Mechanics	4
	01.671		Concrete Design I	4
		01.631	Steel Design I	4
Total A.E. Degree				102

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Surveying and Highway Engineering Technology**Major Code 013***Leading to the Degree of Associate in Engineering*

The program in Surveying and Highway Engineering Technology offers the student the opportunity to prepare to assume responsibilities related to the preparation and calculation of preliminary and legal surveys required for both small projects, such as subdivision work, individual lot layouts, and highway layouts, as well as more complex projects relating to sewer systems, pipelines, power transmission lines, dams, reservoirs, and aqueducts. Employment opportunities are with independent surveying companies, civil engineering companies, highway, transit, and railroad planning groups, as well as cartographers, construction companies, and contractors. Job opportunities will also depend on the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.681 and 10.682). The Mathematics Placement Test must be taken prior to registration.

Each student in English I (30.305) will take a Placement Examination during class. Some students may be requested to register for Elements of Writing (30.304), a 3 q.h. course designed to upgrade the student's background.

Fall	Winter	Spring	First Year	
Course Number				Q.H.
10.607			College Algebra	4
	10.608		Introduction to Calculus	4
		10.620	Calculus I	4
09.670	09.671		Engineering Graphics I, II	8
		09.600	Computer Programming for Eng. Tech.	4
Second Year				
11.617	11.618	11.619	Physics I, II, III	12
	30.305		English I	3
		93.606	Technical Communications I	3
10.621			Calculus A	4
	11.673	11.674	Physics Laboratory I, II	4
Third Year				
12.444			General Chemistry I	3
	30.306		English II	3
		01.641	Fluid Mechanics	4
02.611			Mechanics A	4
	02.614	02.615	Stress Analysis A, B	8
39.301	39.302		Economic Principles and Problems I, II	6
Fourth Year				
01.601			Plane Surveying	4
	01.602		Geodetic Surveying	4
		01.611	Highway Engineering	4
01.607			Legal Aspects of Surveying	4
	01.616		Land Use Planning	4
		01.603	Route Surveying	4
Total A.E. Degree				102

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Civil Engineering Technology

Major Code 014

(Accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology.)

Leading to the Degree of Bachelor of Engineering Technology

The program in Civil Engineering Technology offers the student the opportunity to prepare to assume broad responsibilities related to surveys required to develop initial design criteria and specifications, and to become involved in the planning, design, and construction of all kinds of relatively permanent structures, municipal plants and systems, or transportation systems and facilities. Employment opportunities are in private consulting firms, construction companies, and public works agencies. Work involving surveying, design, and supervision is open to graduates. Job opportunities will also depend on the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.681 and 10.682). The Mathematics Placement Test must be taken prior to registration.

Each student in English I (30.305) will take a Placement Examination during class. Some students may be requested to register for Elements of Writing (30.304), a 3 q.h. course designed to upgrade the student's background.

Fall	Winter	Spring	First Year	
Course Number				Q.H.
10.607			College Algebra	4
	10.608		Introduction to Calculus	4
		10.620	Calculus I	4
09.670	09.671		Engineering Graphics I, II	8
		09.600	Computer Programming for Eng. Tech.	4
Second Year				
11.617	11.618	11.619	Physics I, II, III	12
	30.305		English I	3
		93.606	Technical Communications I	3
10.621			Calculus A	4
	11.673	11.674	Physics Laboratory I, II	4
Third Year				
12.444			General Chemistry I	3
	30.306		English II	3
		02.615	Stress Analysis B	4
02.611			Mechanics A	4
	02.614		Stress Analysis A	4
		01.641	Fluid Mechanics	4
39.301	39.302		Economic Principles and Problems I, II	6

Fourth Year

01.601		Plane Surveying	4
	01.602	Geodetic Surveying	4
		01.603	Route Surveying
()		Arts and Sciences Elective	3
01.624	01.625	Structural Analysis I, II	8
		01.621	Introduction to Design

Fifth Year

01.661		Materials and Soil Mechanics	4	
	01.650	Environmental Engineering I	4	
		01.672	Concrete Design II	4
()		Arts and Sciences Elective	3	
()		Arts and Sciences Elective	3	
	01.671	Concrete Design I	4	
		01.631	Steel Design I	4

Sixth Year

01.632			Steel Design II	4
	01.662		Soil Mechanics and Foundations	4
		01.611	Highway Engineering	4
()	()	()	Arts and Sciences Electives	9
()	()	()	*Lab. Electives	6

Seventh Year

()	()	()	Technical Electives A, B, C	12
()	()	()	Technical Electives A, B, C	12
Total B.E.T. Degree				182

Suggested Technical Electives A

01.607	Legal Aspects of Surveying	4
01.690	Technology of Modern Architecture	4
01.694	Civil Engineering Computer Application	4
05.660	Engineering Economy	4

Suggested Technical Electives B

01.642	Hydraulics	4
01.616	Land Use Planning	4
01.691	Architectural Design I	4

Suggested Technical Electives C

01.651	Environmental Engineering II	4
01.693	Construction Administration	4
01.692	Architectural Design II	4

*Before registering for any electives, the student should submit a proposed program of elective courses—preferably representing a minor field of concentration consistent with his or her personal career objectives—for approval by the Academic Standing Committee.

Suggested Laboratory Electives

01.310 (Summers only)	Surveying Lab.	2
01.314 01.315	Surveying Practice I, II	4
01.380	Environmental Lab.	2
01.364	Materials and Soil Mechanics Lab.	2
02.673	Measurement and Analysis Lab.	2
02.674	Technology Lab.	2

Elective courses for which proper preparation exists may be chosen from inside or outside the Civil Engineering discipline.

Transfer students may petition for elective credits for courses that are suitable to the curriculum.

Graduates of the Bachelor of Engineering Technology programs desiring to pursue programs leading to the Bachelor of Science in Engineering degree at Northeastern University may apply through the Admissions Office (150 RI). Programs in Electrical, Civil, and Mechanical Engineering are available on a part-time as well as a regular cooperative program. Industrial and Chemical Engineering programs are available only during the regular day programs.

Candidates must have at least a 2.75 cumulative average and complete a course program prescribed by the major department and the Dean's Office.

ELECTRICAL ENGINEERING TECHNOLOGY PROGRAMS

Electrical Engineering deals with the design and operation of equipment and systems related to power, communications, data processing, and electrical control. Its major functions are: 1) the generation, transmission, and distribution of electrical energy for light and power purposes; 2) the development and production of equipment for telephone, radio, television, radar, and communication; 3) the design and construction of data processing systems and analog or digital computers; and 4) the application of electrical and electronic devices in the control of processes and manufacture.

Employment opportunities for the Electrical Engineering Technology graduate are in public and private research laboratories, engineering consulting groups dealing with industrial and plant applications, design organizations dealing with operation and manufacture, sales engineering, and the electric utility industry. Job opportunities will depend on the economy and the individual's abilities.

The Electrical Engineering Technology program and related programs offered by Lincoln College are:

Associate in Engineering Degree

Electrical Engineering Technology page 78

Bachelor of Engineering Technology Degree

Electrical Engineering Technology page 79

(Accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology)

The program in Electrical Engineering Technology leading to the Bachelor of Engineering Technology is also offered as a day cooperative program. A specimen curriculum is shown on page 89. For further information please call (617) 437-2200, or write:

Dean of Admissions
Northeastern University
360 Huntington Avenue
Boston, Massachusetts 02115

Electrical Engineering Technology

Major Code 033

Leading to the Degree of Associate in Engineering

The program in Electrical Engineering Technology offers the student the opportunity to prepare to assume responsibilities related to the design, development, and operation of communications, data processing, and electronic control equipment for applications in computers, military and space explorations, and in automated industrial production equipment. Employment opportunities are in communications equipment, electrical manufacturing, data processing and control, equipment organizations, as well as other engineering-oriented companies. Job opportunities will also depend on the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.681 and 10.682). The Mathematics Placement Test must be taken prior to registration.

Fall	Winter	Spring	First Year	
Course Number				Q.H.
10.607			College Algebra	4
	10.608		Introduction to Calculus	4
		10.620	Calculus I	4
09.670		09.672	Eng. Graphics I, Elect. Eng. Graphics	8
	09.600		Computer Programming for Eng. Tech.	4
Second Year				
11.617	11.618	11.619	Physics I, II, III	12
	11.673	11.674	Physics Laboratory I, II	4
10.621			Calculus A	4
	30.305		English I	3
		93.606	Technical Communications I	3
Third Year				
10.622	10.623*		Calculus B, C	8
		02.619	Mechanics	4
03.651	03.652		Circuit Analysis I, II	8
		30.306	English II	3
03.624		03.625	Circuits Laboratory I, II	4

*Arts and sciences elective may substitute for 10.623

Fourth Year

03.611	03.612	03.613	Electronics I, II, III	12
03.653**	03.654†		Circuit Analysis III, IV	8
		03.610	Electrical Measurements	4
		03.623	Electronic Laboratory	2
Total A.E. Degree				103

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Electrical Engineering Technology**Major Code 035**

(Accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology)

Leading to the Degree of Bachelor of Engineering Technology

The program in Electrical Engineering Technology offers the student the opportunity to prepare to assume broad responsibilities related to the design, development, operation, installation, and production of a wide variety of electrical and electronic equipment concerned with the generation and utilization of electric energy, communications, data processing, and industrial control. Employment opportunities are in public and private research laboratories, engineering consulting firms dealing with industrial and plant applications, electric utilities, electrical and electronic organizations concerned with operation, manufacture, installation, and sales. Job opportunities will also depend on the economy and the student's abilities.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.681 and 10.682). The Mathematics Placement Test must be taken prior to registration.

Each student in English I (30.305) will take a Placement Examination during class. Some students may be requested to register for Elements of Writing (30.304), a 3 q.h. course designed to upgrade the student's background.

Fall	Winter	Spring	First Year	Q.H.
Course Number				
10.607			College Algebra	4
	10.608		Introduction to Calculus	4
		10.620	Calculus I	4
09.670		09.672	Eng. Graphics I, Elect. Eng. Graphics	8
	09.600		Computer Programming for Eng. Tech.	4
Second Year				
11.617	11.618	11.619	Physics I, II, III	12
	11.673	11.674	Physics Laboratory I, II	4
10.621			Calculus A	4
	30.305		English I	3
		93.606	Technical Communications I	3

*03.614 may substitute for 03.653.

* *Technical elective may substitute for 03.654.

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Third Year

10.622	10.623		Calculus B, C	8
		02.619	Mechanics	4
03.651	03.652		Circuit Analysis I, II	8
		30.306	English II	3
03.624		03.625	Circuits Laboratory I, II	4

Fourth Year

03.611	03.612	03.613	Electronics I, II, III	12
03.653	03.654		Circuit Analysis III, IV	8
		03.610	Electrical Measurements	4
		03.623	Electronics Laboratory	2

Fifth Year

03.614			Pulse & Digital I	4
	03.()		Technical Elective	4
		03.630	Energy Conversion	4
()	()	()	Arts and Sciences Elective	9
03.627	03.628		Advanced Electronics Labs. I, II	4

Sixth Year

03.670	03.671		Digital Computers I, II	8
		03.637	Distributed Systems	4
()	()	()	Arts and Sciences Electives	9
		03.()	Technical Elective	4
	03.629		Advanced Electronics Lab. III	2

Seventh Year

03.()	03.()		Technical Electives	8
	03.677	03.678	Control Engineering I, II	8
()	()	()	Arts and Sciences Electives	9

Total B.E.T. Degree 180

Suggested Technical Electives

02.621			Thermodynamics	4
02.631			Materials A	4
03.330			Microwave Measurements	2
03.381	03.382	03.383	Linear Active Circuit Design I, II, III	6
03.396			Basic Optics for Instrumentation	2
03.397	03.398		Optical Instrumentation I, II	4
03.531	03.532	03.533	Digital Signal Processing	6
03.615			Pulse & Digital II	4
03.617	03.618	03.619	Principles of Communication Systems I, II, III	12
03.662	03.663	03.664	Basic Power Systems I, II, III	12
04.381	04.382	04.383	Nuclear Technology I, II, III	6
05.660			Engineering Economy I	4
05.590	05.591		Engineering Probability & Statistics I, II	4
09.601			Fortran Engineering Computation	4
09.670			Introduction to CPU Hardware	4

09.671	CPU Hardware Architecture	4
11.624	Introductory Survey of Lasers	2

Electrical Engineering Technology courses of an elective nature may be chosen from the above list of courses.

Elective courses for which proper preparation exists may be chosen from inside or outside the Electrical Engineering discipline.

Graduates of the Bachelor of Engineering Technology program desiring to pursue programs leading to the Bachelor of Science in Engineering degree at Northeastern University may apply through the Admissions Office (150 RI). Programs in Electrical, Civil, and Mechanical Engineering are available on a part-time as well as a regular cooperative program. Industrial and Chemical Engineering programs are available only during the regular day programs.

Candidates must have at least a 2.75 cumulative average and complete a course program prescribed by the major department and the Dean's Office.

*Before registering for any electives, the student should submit a proposed program of elective courses—preferably representing a minor field of concentration consistent with his or her personal career objectives—for approval by the Academic Standing Committee.

03.341, 03.342, 03.343 Power & Control Labs. I, II, III may be substituted for 03.627, 03.628, 03.629 Advanced Electronic Labs. I, II, III.

Electrical Engineering Technology

(Day Cooperative Curriculum)

(Accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology)

Leading to the Degree of Bachelor of Engineering Technology

Fall	Winter	Spring	First Year	Q.H.
Course Number				
10.407	10.408		College Algebra & Trigonometry I, II	8
		10.420	Calculus I	4
11.417	11.418	11.419	Physics I, II, III	12
30.113			Freshman Writing	4
	30.114		Introduction to Literature	4
		30.206	The Literature of Engineering	4
09.470		09.471	Engineering Graphics I, II	8
	11.473	11.474	Physics Laboratory I, II	4
	09.400		Computer Programming for Eng. Tech.	4
Second Year				
10.421	10.422		Calculus A, B	8
03.451	03.452		Circuit Analysis I, II	8
39.115			Principles of Economics	4
	02.419		Mechanics	4
()	()		Social Science/Humanities Electives	8
	03.424		Circuits Laboratory I	2

Third Year

03.453	03.454	Circuit Analysis III, IV	8
03.411	03.412	Electronics I, II	8
03.460		Engineering Analysis I	4
	03.410	Electrical Measurements	4
03.425	03.423	Circuits Lab. II, Electronics Lab.	4

Fourth Year

03.430		Energy Conversions	4
03.413		Electronics III	4
	03.414	Pulse & Digital I	4
03.427	03.428	Advanced Electronics Lab. I, II	4
03.()	03.()	Technical Electives	8
()	()	Social Science/Humanities Electives	8
	03.437	Distributed Systems	4

Fifth Year

03.477	03.478	Control Engineering I, II	8
03.470	03.471	Digital Computers I, II	8
03.()	03.()	Technical Electives	8
03.429		Advanced Electronics Lab. III	2
	()	Social Science/Humanities Elective	4

Total B.E.T. Degree 180

Suggested Technical Electives

02.421	02.422		Thermodynamics A, B	8
02.431	02.432		Materials A, B	8
03.415			Pulse & Digital II	4
03.417	03.418	03.419	Principles of Communication Systems I, II, III	12
03.462	03.463	03.464	Basic Power Systems I, II, III	12
03.490			Optical Measurements	4
04.481			Nuclear Technology	4

Note: Students desiring to terminate their program at the end of Quarter 7 may petition to be awarded the Associate in Engineering degree.

Graduates of the day Bachelor of Engineering Technology program who have maintained a superior level of achievement and who wish to continue their academic studies may be qualified to enter the part-time or full-time program leading to the Bachelor of Science in Engineering. For further information, contact the Lincoln College Office at 408 Churchill Hall, telephone 437-2500.

MECHANICAL ENGINEERING TECHNOLOGY PROGRAMS

Mechanical Engineering deals with the harnessing of power resources by means of machinery to perform useful work. In contrast to civil engineering, which deals primarily with static forces and structures, mechanical engineering

is more concerned with the motion and kinetics of devices which are activated by hydraulic, electrical, mechanical, or thermodynamic forces. Major functions of the mechanical engineer are: 1) design and installation of all kinds of machinery, from pocket watches to the largest of steel boring mills; 2) development and production of engines and transportation equipment (automobile, aircraft, ship, railway, etc.); 3) construction and operation of furnaces, boilers, and heating and air-conditioning equipment for the control of atmospheric and environmental conditions.

Employment opportunities for Mechanical Engineering Technology graduates are in the areas of 1) research, design, or development; 2) production, operation, testing, or control; 3) installation, maintenance, and sales. In performing these functions, graduates will work in close association with professionals in the field and may develop technologically so as to function independently and in positions of managerial responsibility. Job opportunities will also depend on the economy and the individual's abilities.

The Mechanical Engineering Technology program and related programs offered by Lincoln College are:

Associate in Engineering Degree

Mechanical Engineering Technology page 83

Bachelor of Engineering Technology Degree

Mechanical Engineering Technology (Accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology) page 84
 Mechanical—Structural Engineering Technology page 92
 (Accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology)

The program in Mechanical Engineering Technology leading to the Bachelor of Engineering Technology is also offered as a day cooperative program. A specimen curriculum is shown on page 87. For further information please call (617) 437-2200, or write:

Dean of Admissions
 Northeastern University
 360 Huntington Avenue
 Boston, Massachusetts 02115

Mechanical Engineering Technology

Major Code 021

Leading to the Degree of Associate in Engineering

The program in Mechanical Engineering Technology offers the student the opportunity to prepare to assume responsibilities related to the design, production, and installation of mechanical tools, machinery, engines, and transportation equipment in which there

is an intermingling of mechanical and hydraulic forces. Because of the increased mechanization of all industry, varied employment opportunities are available in private engineering consultant groups, in light and heavy industries, and in almost all engineering design organizations. Job opportunities will also depend on the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.681 and 10.682). The Mathematics Placement Test must be taken prior to registration.

Each student in English I (30.305) will take a Placement Examination during class. Some students may be requested to register for Elements of Writing (30.304), a 3 q.h. course designed to upgrade the student's background.

Fall	Winter	Spring	First Year	
Course Number				Q.H.
10.607			College Algebra	4
	10.608		Introduction to Calculus	4
		10.620	Calculus I	4
09.670		09.671	Engineering Graphics I, II	8
	09.600		Computer Programming for Eng. Tech.	4
Second Year				
11.617	11.618	11.619	Physics I, II, III	12
10.621			Calculus A	4
	30.305		English I	3
		93.606	Technical Communications I	3
	11.673	11.674	Physics Laboratory I, II	4
Third Year				
10.622			Calculus B	4
	09.664		Design Graphics	4
		02.631	Materials A	4
02.611	02.612		Mechanics A, B	8
		02.614	Stress Analysis A	4
Fourth Year				
02.615			Stress Analysis B	4
	02.621		Thermodynamics A	4
		02.643	Fluid Mechanics A	4
02.673			Measurement & Analysis Lab.	2
	02.674	02.675	Technology Laboratory A, B	4
()			Arts and Sciences Elective	3
	30.306		English II	3
		39.301	Economic Principles & Problems I	3
Total A.E. Degree				101

Mechanical Engineering Technology

Major Code 023

(Accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology)

Leading to the Degree of Bachelor of Engineering Technology

The program in Mechanical Engineering Technology offers the student the opportunity to prepare to assume broad responsibilities related to the design, development, produc-

tion, operation, and installation of all kinds of machinery, engines, and transportation equipment, as well as boilers, furnaces, and heating or air-conditioning equipment which involve interactions of mechanical, hydraulic, and thermodynamic forces. Employment opportunities are in industry producing mechanized and automated equipment, in design and engineering organizations, and in companies dealing primarily with manufacture and production. Job opportunities will also depend on the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.681 and 10.682). The Mathematics Placement Test must be taken prior to registration.

Each student in English I (30.305) will take a Placement Examination during class. Some students may be requested to register for Elements in Writing (30.304), a 3 q.h. course designed to upgrade the student's background.

Fall	Winter	Spring	First Year	
Course Number				Q.H.
10.607			College Algebra	4
	10.608		Introduction to Calculus	4
		10.620	Calculus I	4
09.670		09.671	Engineering Graphics I, II	8
	09.600		Computer Programming for Eng. Tech.	4
Second Year				
11.617	11.618	11.619	Physics I, II, III	12
10.621			Calculus A	4
	30.305		English I	3
		93.606	Technical Communications I	3
	11.673	11.674	Physics Laboratory I, II	4
Third Year				
10.622			Calculus B	4
	09.664		Design Graphics	4
		02.631	Materials A	4
02.611	02.612		Mechanics A, B	8
		02.614	Stress Analysis A	4
Fourth Year				
02.615			Stress Analysis B	4
	02.621		Thermodynamics A	4
		02.643	Fluid Mechanics A	4
02.673			Measurement & Analysis Lab.	2
	02.674	02.675	Technology Laboratory A, B	4
()			Arts and Sciences Elective	3
	30.306		English II	3
		39.301	Economic Principles & Problems I	3
Fifth Year				
02.613			Mechanics C	4
	02.622		Thermodynamics B	4
		02.623	Refrigeration & Air Conditioning	4

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05.660			Engineering Economy	4
	02.644		Fluid Mechanics B	4
		02.632	Materials B	
		or		
		02.616	Stress Analysis C	4

Sixth Year

02.630			Heat Transfer	4
	02.680	02.681	Mechanical Design A, B	8
02.676	02.677	02.678	Technology Laboratory C, D, E	6
()	()	()	Arts and Sciences Electives	9

Seventh Year

()	()	()	Technical Electives	12
()		()	Arts and Sciences Electives	6
	03.620		Electricity & Electronics	4
()	()		Arts and Sciences Electives	6

Total B.E.T. Degree	180
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Suggested Technical Electives

		01.601	Plane Surveying	4
		01.631	Steel Design I	4
		01.671	Concrete Design	4
		02.616	Stress Analysis C	4
		02.632	Materials B	4
		02.633	Applied Metallurgy	4
		02.651	Mechanical Vibrations	4
		02.652	Experimental Stress Analysis	4
		02.679	Power Generation	4
		03.621	Electricity and Electronics II	4
	05.582	05.583	Industrial Technology I, II	4
04.381	04.382	04.383	Nuclear Technology I, II, III	6
		09.601	Fortran Engineering Computation	4

Transfer students may petition for elective credits for courses that are suitable to the curriculum.

Graduates of the Bachelor of Engineering Technology program desiring to pursue programs leading to the Bachelor of Science in Engineering degree at Northeastern University may apply through the Admissions Office (150 RI). Programs in Electrical, Civil, and Mechanical Engineering are available on a part-time as well as a regular day cooperative program. Industrial and Chemical Engineering programs are available only during the regular day programs.

Candidates must have at least a 2.75 cumulative average and complete a course program prescribed by the major department and the Dean's Office.

*Before registering for any electives, the student should submit a proposed program of elective courses—preferably representing a minor field of concentration consistent with his or her personal career objectives—for approval by the Academic Standing Committee.

10.623 Calculus C is recommended for all students planning advanced engineering technology subjects.

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Mechanical Engineering Technology

(Day Cooperative Curriculum)

(Accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology)

Leading to the Degree of Bachelor of Engineering Technology

Fall	Winter	Spring	First Year	Q.H.
Course Number				
10.407	10.408		College Algebra & Trigonometry I, II	8
		10.420	Calculus I	4
11.417	11.418	11.419	Physics I, II, III	12
30.113			Freshman Writing	4
	11.473	11.474	Physics Labs. I, II	4
09.470			Engineering Graphics I	
or				4
06.400			Computer Programming for Eng. Tech.	
	30.114		Introduction to Literature	4
		30.206	The Literature of Engineering	4
	09.400		Computer Programming for Eng. Tech.	
	or			4
	09.470		Engineering Graphics I	
		09.471	Engineering Graphics II	4
Second Year				
10.421	10.422		Calculus A, B	8
09.464			Engineering Design Graphics	4
02.411			Mechanics A	4
	02.412		Mechanics B	4
	02.414		Stress Analysis A	4
03.420			Electricity & Electronics I	4
	()		Social Science/Humanities Elective	4
Third Year				
02.415			Stress Analysis B	4
	02.431		Materials A	4
02.473			Measurement & Analysis Lab.	2
	02.474		Technology Lab. A	2
02.421	02.422		Thermodynamics A, B	8
02.413			Mechanics C	4
	02.443		Fluid Mechanics A	4
39.115			Economic Principles & Problems	4

Note: Students desiring to terminate their program at the end of Quarter 7 may petition to be awarded the Associate in Engineering degree.

Fourth Year

02.480	02.481	Mechanical Design A, B	8
02.475	02.476	Technology Labs. B, C	4
02.444		Fluid Mechanics B	4
	02.423	Refrigeration & Air Conditioning	4
02.461		Machine Shop (Industrial Engineering Elective on petition with experience)	4
	()	Social Science/Humanities Elective	4
()		Social Science/Humanities Elective	4

Fifth Year

02.477	02.478	Technology Labs. D, E	4
05.460		Engineering Economy	4
	02.430	Heat Transfer	4
()		Social Science/Humanities Elective	4
	()	Technical Elective	4
()		Technical Elective	4
	()	Social Science/Humanities Elective	4
02.432		Materials B	
		or	
02.416		Stress Analysis C	4

Total B.E.T. Degree	180
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Technical Electives Must be Chosen from the Following List:

02.416	Stress Analysis C	4
02.452	Exp. Stress Analysis	4
02.451	Mech. Vibrations	4
02.432	Materials B	4
02.433	Applied Metallurgy	4
02.479	Power Generation	4
10.423	Differential Equations	4
03.421	Electricity & Electronics II	4
03.490	Optical Instrumentation	4
04.481	Nuclear Technology	4

Graduates of the day Bachelor of Engineering Technology program who have maintained a superior level of achievement and who wish to continue their academic studies may be qualified to enter the part-time or full-time program leading to the Bachelor of Science in Engineering. For further information contact the Lincoln College Office at 408 Churchill Hall, telephone 437-2500.

INTERDISCIPLINARY ENGINEERING AND SCIENCE TECHNOLOGY PROGRAMS

These programs offered by Lincoln College present a variety of interdisciplinary combinations of the Engineering Technology programs and the Science programs (chemistry, physics, and mathematics). They have been developed to meet the need for technologists in the areas of ecology, bioelectronic devices, computer systems, and other technological applications requiring an expertise in several of the academic disciplines.

This demand for multi-skilled technologists reflects the increased reliance of society on the science and engineering technologist to help solve its growth problems. Opportunities are also developing in highly interdisciplinary fields such as ocean engineering, bioengineering, environmental science, and public health.

The programs are designed to offer the student the opportunity to prepare to meet the challenge of interfacing technology and society. The engineering technology student not only learns about related disciplines, but also becomes oriented in the disciplines to which his or her technological skills will be applied. A program of concentrated study in chemistry and physics or mathematics and physics is offered to the science technology student.

Interdisciplinary Engineering and Science Technology programs offered to Lincoln College students are:

Associate in Engineering Degree

Computer Technology page 89

Bachelor of Engineering Technology Degree

Mechanical-Structural Engineering Technology page 92

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Computer Technology

Major Code 036

Leading to the Degree of Associate in Engineering

The Computer Technology program offers students the opportunity to provide themselves with the mathematical and technological background for understanding both the hardware and software aspects of computer systems, and so will be prepared as: a) programmers who translate engineering, scientific, and business concepts into meaningful form for the computer; b) engineering technicians concerned with the development, specification, production, and operation of computer hardware; and c) applications technicians dealing with the interface of the computer with industrial process and control systems or data acquisition, reduction, and display systems. Job opportunities will also depend on the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.681 and 10.682). The Mathematics Placement Test must be taken prior to registration.

Each student in English I (30.305) will take a Placement Examination during class. Some students may be requested to register for Elements of Writing (30.304), a 3 q.h. course designed to upgrade the student's background.

Fall	Winter	Spring	First Year	
Course Number				Q.H.
10.607			College Algebra	4
	10.608		Introduction to Calculus	4

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09.605		10.620	Calculus I	4
			Introduction to Programming	4
	09.670		Engineering Graphics I	4
		09.650	Basic Computer Organization	4
Second Year				
11.617	11.618	11.619	Physics I, II, III	12
10.621			Calculus A	4
	11.673	11.674	Physics Laboratory I, II	4
	30.305		English I	3
		93.404	Technical Communications	3
Third Year				
10.622			Calculus B	4
	09.610		Fortran	4
		09.668	Semiconductor Logic	4
03.651	03.652		Circuit Analysis I, II	8
		30.306	English II	3
		()	Arts and Sciences Elective	3
Fourth Year				
09.640			Modern Programming Techniques	4
	09.645		Assembly Language	4
		09.674	Introduction to CPU Hardware	4
09.669			Computer Logic	4
	03.611		Electronics I	4
		09.620	Cobol	4
Total A.E. Degree				100

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Computer Technology

Major Code 037

Leading to the Degree of Bachelor of Engineering Technology

The Computer Technology program offers students the opportunity to prepare themselves to be knowledgeable in both hardware and software. The balance of hardware and software courses combined with hands-on laboratory experience provides the student with the opportunity to develop the skill for interfacing the computer with process plants or machinery. Other employment possibilities exist in programming the computer for engineering, scientific, and business applications; designing, engineering, and testing computers; and interfacing computers with various types of equipment for automated drafting, data collection, and display. Job opportunities will also depend upon the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.681 and 10.682). The Mathematics Placement Test must be taken prior to registration.

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Each student in English I (30.305) will take a Placement Examination during class. Some students may be requested to register for Elements of Writing (30.304), a 3 q.h. course designed to upgrade the student's background.

Fall	Winter	Spring	First Year	Q.H.
Course Number				
10.607			College Algebra	4
	10.608		Introduction to Calculus	4
		10.620	Calculus I	4
09.605			Introduction to Programming	4
	09.670		Engineering Graphics I	4
		09.650	Basic Computer Organization	4
Second Year				
11.617	11.618	11.619	Physics I, II, III	12
10.621			Calculus A	4
	11.673	11.674	Physics Laboratory I, II	4
	30.305		English I	3
		93.606	Technical Communications I	3
Third Year				
10.622			Calculus B	4
	09.610		Fortran	4
		09.668	Semiconductor Logic	4
03.651	03.652		Circuit Analysis I, II	8
		30.306	English II	3
		()	Arts and Sciences Elective	3
Fourth Year				
09.640			Modern Programming Techniques	4
	09.645		Assembly Language	4
		09.674	Introduction to CPU Hardware	4
09.669			Computer Logic	4
	03.611		Electronics I	4
		09.620	Cobol	4
Fifth Year				
09.675			CPU Hardware Architecture	4
	09.651		Advanced Computer Organization	4
		09.()	Computer Technical Elective	4
09.630			Non-Numerical Algorithms	4
	()	()	Arts and Sciences Elective	6
		39.301	Economic Principles and Problems	3
	()	()	Arts and Sciences Elective	6
Sixth Year				
09.655			Micro-Peripheral Hardware	4
	09.635		Numerical Algorithms	4
		09.680	Data Communications Methods	4

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09.()	Computer Technical Elective	4
()	Arts and Sciences Elective	3
()	Technical Elective	4
()	Arts and Sciences Elective	3

Seventh Year

09.660	Industry Software	4
09.665	Industry Hardware	4
09.()	Computer Technical Elective	4
09.656	Complex Peripheral Hardware	4
()	Technical Elective	4
()	Arts and Sciences Elective	3
()	Arts and Sciences Elective	3

Total B.E.T. Degree	180
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Computer Technical Electives

09.681	Operating Systems	4
09.682	Computer Graphics Programming	4
09.683	Data Bases	4
09.684	Large System Assembly Languages	4
09.685	Introduction to Simulation Programming	4
09.686	Device System Hardware	4
09.687	Bit Slice Microcomputers	4
09.688	Micro Controllers	4
09.689	Single Chip Micro Processors	4
09.690	Special Problems in Computer Technology	4

All other technical electives may be chosen from other engineering technology or science disciplines within Lincoln or University colleges, subject to the department chairperson's approval.

Graduates of the Bachelor of Engineering Technology program desiring to pursue programs leading to the Bachelor of Science in Engineering degree at Northeastern University may apply through the Admissions Office (150 RI). Programs in Electrical, Civil, and Mechanical Engineering are available on a part-time as well as a regular cooperative program. Industrial and Chemical Engineering programs are available only during the regular day programs.

Candidates must have at least a 2.75 cumulative average and complete a course program prescribed by the major department and the Dean's Office.

Mechanical-Structural Engineering Technology

Major Code 015

(Accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology.)

Leading to the Degree of Bachelor of Engineering Technology

The program in Mechanical-Structural Engineering Technology is interdisciplinary in that it provides the opportunity for students to prepare themselves to assume responsibilities related to both the planning and construction of relatively static structures such as buildings, bridges, and docks, and also the design and production of dynamic machine tools, machinery, and other mechanical devices. The mechanical and structural content

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is integrated so as to be complementary and to provide a broad base for design problems of great variety. Employment opportunities lie in the architectural, construction, civil, and mechanical professions and companies.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.681 and 10.682). The Mathematics Placement Test must be taken prior to registration.

Each student in English I (30.305) will take a Placement Examination during class. Some students may be requested to register for Elements of Writing (30.304), a 3 q.h. course designed to upgrade the student's background.

Fall	Winter	Spring	First Year	
Course Number				Q.H.
10.607			College Algebra	4
	10.608		Introduction to Calculus	4
		10.620	Calculus I	4
09.670		09.671	Engineering Graphics I, II	8
	09.600		Computer Programming for Eng. Tech.	4
Second Year				
11.617	11.618	11.619	Physics I, II, III	12
10.621			Calculus A	4
	30.305		English I	3
		93.606	Technical Communications I	3
	11.673	11.674	Physics Laboratory I, II	4
Third Year				
10.622			Calculus B	4
02.611			Mechanics A	4
		02.631	Materials A	4
02.612			Mechanics B	4
	02.614		Stress Analysis A	4
		02.643	Fluid Mechanics A	4
Fourth Year				
02.615			Stress Analysis B	4
	02.644		Fluid Mechanics B	4
		01.621	Introduction to Structural Design	4
02.673			Measurement & Analysis Lab.	2
	02.674	02.675	Technology Laboratory A, B	4
()			Arts and Sciences Elective	3
	30.306		English II	3
		39.301	Economic Principles & Problems I	3
Fifth Year				
02.613			Mechanics C	4
	01.625		Structural Analysis II	4
		01.631	Steel Design I	4
01.624			Structural Analysis I	4
	()	()	Technical Electives	8

Sixth Year

01.632			Steel Design II	4
	01.671	01.672	Concrete Design I, II	8
()			Arts and Sciences Elective	3
	()	()	Technical Electives	8
()	()		Arts and Sciences Electives	6

Seventh Year

	02.680	02.681	Mechanical Design A, B	8
()			Technical Elective	4
()		()	Arts and Sciences Electives	6
	()		Laboratory Elective	2
()	()		Arts and Sciences Electives	6

Total B.E.T. Degree	180
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Suggested Technical Electives

01.601	Plane Surveying	4
01.661	Materials & Soil Mechanics	4
01.662	Soil Mechanics & Foundations	4
01.693	Construction Administration	4
02.616	Stress Analysis C	4
02.621	Thermodynamics A	4
02.632	Materials B	4
02.633	Applied Metallurgy	4
02.651	Mechanical Vibrations	4
02.652	Experimental Stress Analysis	4
05.590	Engineering Probability & Statistics I	4
05.591	Engineering Probability and Statistics II	4
09.601	Fortran Engineering Computation	4

Elective courses for which proper preparation exists may be chosen from inside or outside of the Mechanical-Structural Engineering discipline.

Transfer students may petition for elective credits for courses that are suitable to the curriculum.

Graduates of the Bachelor of Engineering Technology program desiring to pursue programs leading to the Bachelor of Science in Engineering degree at Northeastern University may apply through the Admissions Office (150 RI). Programs in Electrical, Civil, and Mechanical Engineering are available on a part-time as well as a regular cooperative program. Industrial and Chemical Engineering programs are available only during the regular day programs.

Candidates must have at least a 2.75 cumulative average and complete a course program prescribed by the major department and the Dean's Office.

Before registering for any electives, the student should submit a proposed program of elective courses—preferably representing a minor field of concentration consistent with his or her personal career objectives—for approval by the Academic Standing Committee. 10.622, 10.623 are recommended for all students planning advanced engineering technology subjects.

description of courses

On the pages which follow is a numerical and descriptive listing of courses offered in the several curricula of Lincoln College. Although not all courses are offered every year, all will be offered during the normal period of each student's curriculum, except for those special courses as defined in the departmental heading of the following course descriptions. The term "prerequisite" indicates a course that must be taken before undertaking the advanced course to which it applies.

A "quarter hour" equals approximately three clock hours of work (approximately fifty minutes of class and two hours of preparation a week for a quarter of 12 weeks' duration). Laboratory and drawing courses normally require fewer hours of outside preparation and therefore carry less credit than lecture courses.

Abbreviations

prereq.—prerequisite
coreq.—corequisite
cl.—class hours

lab.—laboratory hours
q.h.—quarter hours

Policy on Changes of Program

Lincoln College reserves the right to cancel, modify, or add to the courses offered, or to change the order or content of courses in any curriculum.

The University further reserves the right to change the requirements for graduation, tuition, fees charged, and other regulations. However, no change in tuition and fees at any time shall become effective until the school year following that in which it is announced.

Any changes which may be made from time to time relative to the above policy shall be applicable to all students in the school, college, or department concerned, including former students who may re-enroll.

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CIVIL ENGINEERING TECHNOLOGY

01.310 Surveying Laboratory (3 lab., 2 q.h.)

An outdoor lab in use of level, transit, and plane table. Level circuits and a transit-tape traverse are run. Topography and layout problems are given. *Prereq.* 01.601.

01.314 Surveying Practice I (1 cl., 2 lab., 2 q.h.)

Computing and balancing a control traverse; calculating exact property lines, vertical control survey; plotting from topographic field notes. *Prereq.* 01.603.

01.315 Surveying Practice II (1 cl., 2 lab., 2 q.h.)

Scale drawing of the proposed subdivision; calculations required by the land court for the subdivision; street profiles showing grades; drainage study. *Prereq.* 01.314.

01.364 Materials and Soil Mechanics Lab. (3 lab., 2 q.h.)

Grain size analysis; specific gravity; CBR optimum moisture; direct shear seepage and flow nets; consolidation test. *Prereq.* 01.661.

01.601 Plane Surveying (4 cl., 4 q.h.)

Surveying principles; theory of measurements; leveling; traverse computations; area calculation; stadia principles and topography. *Prereq.* 10.608.

01.602 Geodetic Surveying (2 cl., 4 lab., 4 q.h.)

Introduction to practical astronomy for surveying, including basic spherical trigonometry. Introduction to geodetic surveying, including precise leveling, triangulation, EDM equipment, and base line measurements. *Prereq.* 01.601.

01.603 Route Surveying (4 cl., 4 q.h.)

Simple and compound curves; vertical curves; earthwork computations; solution of the mass diagram; introduction to route location by photogrammetry. *Prereq.* 01.601.

01.607 Legal Aspects of Surveying (4 cl., 4 q.h.)

Registry of deeds and probate; ownership of land; deeds, descriptions and qualifying expressions; adverse possession; Massachusetts land court; expert witness.

Prereq. 01.601.

01.611 Highway Engineering (4 cl., 4 q.h.)

Engineering considerations in the planning and construction of modern highways and highway routing; traffic flow and traffic control; computer applications to transportation problems. *Prereq.* 01.601.

01.616 Land Use Planning (4 cl., 4 q.h.)

Environmental, sociological, economic aspects, and traditional basis for land use planning. Objectives, content, form and preparation of plan. Community and public facilities, transportation; environmental impact and plan implementation. *Prereq.* 09.671.

01.621 Introduction to Structural Design (2 cl., 4 lab., 4 q.h.)

Tabular methods for the design of members and connections using the AISC Code.

Prereq. 02.614, 09.671.

01.624 Structural Analysis I (4 cl., 4 q.h.)

Reactions, shears, bending moments, and forces developed by loading systems on beams and trusses. Influence lines for beams, girders and trusses; solutions for forces from moving load systems on statically determinate structures. *Prereq.* 02.615.

01.625 Structural Analysis II (4 cl., 4 q.h.)

Classical methods of deflection solution for beams and trusses. Methods of solving statically indeterminate structures. *Prereq.* 01.624.

01.631 Steel Design I (4 cl., 4 q.h.)

Design of steel members in structural frames; tension, compression, bending and eccentrically loaded members. Design of plate girders for buildings. *Prereq.* 01.621, 02.615.

01.632 Steel Design II (4 cl., 4 q.h.)

Design of steel for highway bridges, composite design in bridges and buildings, introduction to plastic analysis and design in steel. *Prereq.* 01.631.

01.641 Fluid Mechanics (4 cl., 4 q.h.)

Hydrostatics; pressure measurement; hydrostatic forces on submerged areas; simple dams; fluid dynamics; kinematics of flow; continuity, momentum and energy equations; orifices; Pi theorem; laminar and turbulent flow. *Prereq.* 02.614.

01.642 Hydraulics (4 cl., 4 q.h.)

Flow in closed conduits; empirical formulas for closed conduit flow; minor losses; compound pipe systems; open channel flow; specific energy and stage relationships; fluid measurement systems; hydraulic machinery. *Prereq.* 01.641.

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01.650 Environmental I (4 cl., 4 q.h.)

Principles of water supply engineering; population forecasting; quality and quantity of water for various uses. Water treatment processes. Collection and disposal of waste water and storm water; modern treatment methods and waste water plant operation.

Prereq. 12.444 and 01.641.

01.651 Environmental II (2 cl., 4 lab., 4 q.h.)

Layout and design of water treatment and sewage treatment plants. Instrumentation and electrical equipment. Laboratory demonstrations. *Prereq.* 01.650.

01.652 Environmental Lab. (3 lab., 2 q.h.)

Methods and techniques for the physical, chemical, and bacteriological examination of water and waste water, and approaches to treatment through bench scale studies.

Prereq. 01.650.

01.661 Materials and Soil Mechanics (4 cl., 4 q.h.)

Physical properties of portland cement, aggregates, mixing water and admixtures; batch proportioning; bituminous materials; index properties of soils, soil moisture and structure; compressibility, theory of consolidation. *Prereq.* 02.615.

01.662 Soil Mechanics and Foundations (4 cl., 4 q.h.)

Shear strength of soils, distribution of stress; settlement computations; lateral earth pressures; bearing capacity; soil compaction, soil stabilization, and site investigation.

Prereq. 01.661.

01.671 Concrete Design I (4 cl., 4 q.h.)

Design of bending members, axially and eccentrically loaded columns by elastic and ultimate strength principles. *Prereq.* 02.615.

01.672 Concrete Design II (4 cl., 4 q.h.)

Reinforced concrete design of basic structures, including considerations of continuity. Introduction to prestressed concrete member design. *Prereq.* 01.671.

01.690 Technology of Modern Architecture (4 cl., 4 q.h.)

General background of architectural styles, both historical and contemporary, with emphasis on engineering design and construction procedures required for the various types of buildings.

01.691 Architectural Design I (4 cl., 4 q.h.)

Basic architectural design concepts; proportion, scale form, massing, color texture, and lighting. Orientation of structures; site organization; selection of building materials.

Prereq. 09.671, 01.690.

01.692 Architectural Design II (4 cl., 4 q.h.)

Consideration of the building process. Individual architectural design projects assigned by the instructor. *Prereq.* 01.691.

01.693 Construction Administration (4 cl., 4 q.h.)

Contracts, specifications, and bidding procedures; estimating and scheduling, including critical path; discussion of personnel administration and union negotiation. Bid preparation for a small project.

01.694 Civil Engineering Computer Applications (4 cl., 4 q.h.)

An introduction to the systems approach to typical civil engineering problems and their solution using computer applications. *Prereq.* 01.625, 01.650, 01.661, 01.603.

MECHANICAL ENGINEERING TECHNOLOGY**02.411 Mechanics A (4 cl., 4 q.h.)**

(Day Curriculum)

Forces, moments, couples, statics of particles and rigid bodies in two and three dimensions; distributed forces—external and internal; first moments and centroids; analysis of structure—trusses, frames, and machines. *Prereq.* 10.420 or 10.620, 11.417 or 11.617.

02.412 Mechanics B (4 cl., 4 q.h.)

(Day Curriculum)

Friction, second moments, and virtual work; kinematics of particles—rectilinear and curvilinear motion of dynamic particles—force, mass and acceleration, work and energy. *Prereq.* 02.411 or 02.611.

02.413 Mechanics C (4 cl., 4 q.h.)

(Day Curriculum)

Impulse and momentum of particles; kinematics and dynamics of rigid bodies—force, mass, and acceleration; dynamics of rigid bodies—work and energy, impulse and momentum; introduction to mechanical vibration. *Prereq.* 02.412 or 02.612.

02.414 Stress Analysis A (4 cl., 4 q.h.)

(Day Curriculum)

Axially loaded members; stress and strain, allowable stresses, factor of safety, temperature effects, indeterminate members; thin-walled pressure vessels; centric loading of bolted and welded connection. Shear and moment in beams; eccentrically loaded connections; flexural and transverse shearing stresses in beams. *Prereq.* 02.411 or 02.611.

02.415 Stress Analysis B (4 cl., 4 q.h.)

(Day Curriculum)

Determinate and indeterminate beam deflections and reactions by integration and area moment methods. Torsional stresses and strains; power transmission; eccentric loads on struts, beams, riveted and welded joints; combined stresses; principal stresses; Mohr's circle; theories of failure. *Prereq.* 02.414 or 02.614

02.416 Stress Analysis C (4 cl., 4 q.h.)

(Day Curriculum)

Curved beams; nonsymmetrical bending of beams; shear-center and shear stresses on thin sections; composite beams. Columns; energy absorption and resilience; inertial stresses, impact loading; deflection of beams by energy methods. Bolted fastenings. *Prereq.* 02.415 or 02.615.

02.419 Mechanics (4 cl., 4 q.h.)

(Day Curriculum)

A mechanics course for nonmechanical students. *Prereq.* 10.420 or 10.620, 11.417 or 11.617.

02.421 Thermodynamics A (4 cl., 4 q.h.)

(Day Curriculum)

General theory of heat and matter; laws of thermodynamics; energy-transformation principles and availability of energy; properties and processes for pure substances and ideal gases. Thermodynamic properties and processes of liquids and vapors; tables and charts; mixtures of fluids; vapor cycles. *Prereq.* 11.418 or 11.618.

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02.422 Thermodynamics B (4 cl., 4 q.h.) (Day Curriculum)

Theory of vapor engines and analysis of types of actual engines using compression of gases and vapors; internal combustion engines. Theory of gas and vapor flow through orifices and nozzles. Design and performance of steam and gas turbines; spark-ignition and compression-ignition engine design and performance. Fan performance. *Prereq. 02.421 or 02.621.*

02.423 Refrigeration & Air Conditioning (4 cl., 4 q.h.) (Day Curriculum)

Air conditioning principles, including psychometrics and heat pumps. Calculation of heating and cooling loads in accordance with A.S.H.R.A.E. practices. Principles of gas compression; analysis of vapor compression; refrigeration systems; low-temperature refrigeration cycles; and absorption refrigeration systems. *Prereq. 02.422 or 02.622.*

02.430 Heat Transfer (4 cl., 4 q.h.) (Day Curriculum)

The primary modes of heat transfer; thermal conductivity; thermal conductance/resistance concept; thermal-electrical analogy; combined heat transfer mechanisms, basic equations of conduction; analytical solutions of various steady state conduction problems. Dimensional analysis and similarity considerations; natural and forced convection; hydrodynamic and thermal boundary layers; black body radiation; Kirchhoff's law; emissivity and absorptivity; radiation between simple bodies; numerical methods. Log mean temperature differences; overall heat transfer coefficients; heat exchanger effectiveness; tubular exchanger design; regenerative and evaporative heat exchangers; heat transfer engineering problems. *Prereq. 02.422 or 02.622.*

02.431 Materials A (4 cl., 4 q.h.) (Day Curriculum)

Lectures on: fundamental metallic structures; general metallurgical information covering theoretical aspects of properties; testing and failure of metals; supplemented by visual aids. Lectures on: alloying and hardening of metals; refinement of metals; equilibrium diagrams; characteristics of engineering metals; principles of metal fabrication.

02.432 Materials B (4 cl., 4 q.h.) (Day Curriculum)

Lectures on: inorganic materials, i.e., polymers, glasses, ceramics, cements, wood, and materials having important electrical and magnetic properties; also a summary of the most up-to-date applications for the fabrication and uses of both metals and nonmetals. Structures of metals; imperfections; phase diagrams; effect of temperature on structure and properties of metals (annealing, recrystallization, recovery, precipitation, diffusion); strengthening mechanisms; mechanical properties of nonferrous metals. Laboratory: experiments in preparation of samples, selection, polishing, and etching; examination of nonferrous metals; use of the microscope; linear analysis; construction of cooling curves; and simple binary phase diagrams. *Prereq. 02.431 or 02.631.*

02.433 Applied Metallurgy (4 cl., 4 q.h.) (Day Curriculum)

Lectures on: mechanical properties of ferrous metals, the iron carbon diagram, high-temperature alloys, hardening methods, impact tests, effects of environment on metals; manufacturing processes; methods of fabrication; limitations on the use of different materials and processes; casting, welding, cutting, drawing, powder metallurgy. Laboratory: experiments on analysis of stress-strain diagrams of iron and steel, heat treatment of steels, surface corrosion, tempering and drawing, use of metallograph and analysis of the results. Experiments in cold rolling, swaging, drawing of nonferrous metals

and the analysis of the results. Tension, shear, fatigue, and machinability tests on ferrous metals. *Prereq.* 02.432 or 02.632.

02.443 Fluid Mechanics A (4 cl., 4 q.h.) (Day Curriculum)

Hydrostatics, principles governing fluids at rest; pressure measurement; hydrostatic forces on submerged areas and objects; simple dams; fluids in moving vessels; hoop tension. Fluid flow in pipes under pressure; fluid energy, power and friction loss; Bernoulli's Theorem; flow measurement. *Prereq.* 02.412 or 02.612.

02.444 Fluid Mechanics B (4 cl., 4 q.h.) (Day Curriculum)

Pipe networks and reservoir systems; flow in open channels; uniform flow; energy, friction loss, minor losses, velocity distribution, alternate stages of flow, critical flow; nonuniform flow; accelerated and retarded flow; hydraulic jump and waves. *Prereq.* 02.443 or 02.643.

02.451 Mechanical Vibrations (4 cl., 4 q.h.) (Day Curriculum)

Elements of vibrating systems, one degree of freedom (undamped free and forced vibration from Newton's law of motion and energy methods); natural frequencies; damped free and forced vibration; impedance and mobility; systems with more than one degree of freedom; influence coefficients, Lagrange's equations, generalized coordinates, vibration absorber. *Prereq.* 02.413 or 02.613.

02.452 Experimental Stress Analysis (4 cl., 4 q.h.) (Day Curriculum)

Theory and experimentation showing the application of extensometers and electrical strain gauges and as transducers in the field of experimental stress and strain analysis. Theory and laboratory practice on photoelastic methods as applied to classical model analysis and modern coating analysis. *Prereq.* 02.415 or 02.615.

02.461 Machine Shop (2 cl., 3 lab., 4 q.h.) (Day Curriculum)

Introduction to study of machines for metal processing, cutting tools, and fluids; machinability; automatic machinery. *Prereq.* none.

02.473 Measurement & Analysis Laboratory (3 lab., 2 q.h.) (Day Curriculum)

Experimental procedures for the collection and analysis of data by graphical and numerical methods, including computer applications, report writing that draws conclusions which are relative to accuracy, precision, true values, and measured values as they are related to basic mechanical measuring instruments for length, area, volume, specific gravity, pressure, temperature, and time as these parameters are utilized in making mechanical measurements. *Prereq.* 02.414 or 02.614, 06.400 or 06.600, 10.422 or 10.622, 11.419 or 11.619.

02.474 Technology Laboratory A (3 lab., 2 q.h.) (Day Curriculum)

Experimental procedures to determine mechanical properties of materials under tensile, compressive, torsional, direct shear, flexural, impact, fatigue, and creep loading conditions as they are affected by environmental conditions that are normal and abnormal; also as they are affected by homogeneity, nonhomogeneity, isotropy, and nonisotropy. *Prereq.* 02.473 or 02.673, 02.415 or 02.615, 03.431 or 02.631, or concurrently.

02.475 Technology Laboratory B (3 lab., 2 q.h.) (Day Curriculum)

Experimental procedures to determine the physical properties of incompressible fluids, measure the flow rates and velocities utilizing pitot tubes, orifice plates, venturii meter,

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and weirs flow meters, U tube differential manometers, and piezometers as the fluid flows through open channels, partially filled conduits, conduits under pressure, pipe networks, turbines, and pumps. *Prereq.* 02.473 or 02.673, 02.443 or 02.643, or concurrently.

02.476 Technology Laboratory C (3 lab., 2 q.h.) (Day Curriculum)

Basic thermodynamic relationships; experimental procedures to examine the flow of compressible fluids and steam; examine the energy conversion of a fuel into a working substance and the related heat transfer mechanisms. Operating characteristics of thermal generators, engines, and compressors. *Prereq.* 02.473 or 02.673, 02.422 or 02.622, or concurrently.

02.477 Technology Laboratory D (3 lab., 2 q.h.) (Day Curriculum)

Experimental procedures to examine the operating characteristics and efficiencies of internal combustion engines, brake horsepower, indicated horsepower, friction horsepower, mean effective pressure, fuel consumption, torque, ignition timing, manifold pressure, and compression ratios and internal engines as energy conversion systems; energy conversion of fuels. *Prereq.* 02.476 or 02.676, 02.422 or 02.622, 02.430 or 02.630, or concurrently.

02.478 Technology Laboratory E (3 lab., 2 q.h.) (Day Curriculum)

Experimental procedures of a project nature to examine refrigeration, air conditioning, and heating pump cycles. A project of analytical, design, or experimental nature. Experiments of advanced or specialized nature. *Prereq.* 02.473 or 02.673, 02.423 or 02.623, 02.430 or 02.630.

02.479 Power Generation (4 cl., 4 q.h.) (Day Curriculum)

Basic power generation cycles; gas turbine cycles; effects of combustor temperature, intercooling, etc., on cycle performance; Rankine regenerative cycles; effects of steam temperature, pressure, number of feedwater heaters, etc., upon performance; steam generation equipment: boilers, reactors.

Fossil fuel characteristics and effects on boiler design; combustion analysis; draft calculations; axial and centrifugal fan performance characteristics; pump design and performance considerations; heat exchanger design considerations.

Applications of principles of economics to cycle and performance considerations; use of load curves; economic considerations of heat rate; economics of equipment selection; study of auxiliary equipment such as precipitators and flue gas desulfurization systems. *Prereq.* 02.422 or 02.622.

02.480 Mechanical Design A (4 cl., 4 q.h.) (Day Curriculum)

Introduction to mechanical design, the design process, design factors, creativity, optimization, human factors, value engineering. These principles discussed and developed in an introductory manner through simple design projects.

Principles of design, properties, and selection of materials; stress concentrations; strength under combined stresses; theories of failure; impact and fluctuating and repeated loads. *Prereq.* 02.415 or 02.615 or 02.431 or 02.631.

02.481 Mechanical Design B (4 cl., 4 q.h.) (Day Curriculum)

Stresses; deformation and design of fasteners, screws, joints, springs, and bearings; lubrication and journal bearings.

Stresses and power transmission of spur, bevel, and worm gear; shaft design; clutches and brakes. *Prereq.* 02.480 or 02.680.

02.499 Special Problems in Mechanical Engineering Technology (4 q.h.)
(Day Curriculum)
Theoretical or experimental work under individual faculty supervision. *Prereq.* Consent of department chairperson.

02.598 Special Problems in Mechanical Engineering Technology (2 q.h.)
Theoretical or experimental work under individual faculty supervision. *Prereq.* Consent of department chairperson.

02.599 Special Problems in Mechanical Engineering Technology (4 q.h.)
Theoretical or experimental work under individual faculty supervision. *Prereq.* Consent of department chairperson.

02.611 Mechanics A (4 cl., 4 q.h.)
Forces; moments, couples, statics of particles and rigid bodies in two and three dimensions; distributed forces—external and internal; first moments and centroids; analysis of structure-trusses, frames, and machines. *Prereq.* 10.420 or 10.620, 11.417 or 11.617.

02.612 Mechanics B (4 cl., 4 q.h.)
Friction, second moments, and virtual work; kinematics of particles—rectilinear and curvilinear motion of dynamic particles—force, mass and acceleration, work and energy. *Prereq.* 02.411 or 02.611.

02.613 Mechanics C (4 cl., 4 q.h.)
Impulse and momentum of particles; kinematics and dynamics of rigid bodies—force—mass, and acceleration; dynamics of rigid bodies—work and energy. Impulse and momentum; introduction to mechanical vibration. *Prereq.* 02.412 or 02.612.

02.614 Stress Analysis A (4 cl., 4 q.h.)
Axially loaded members; stress and strain, allowable stresses, factor of safety, temperature effects, indeterminate members; thin-walled pressure vessels; centric loading of bolted and welded connection. Shear and moment in beams; eccentrically loaded connections; flexural and transverse shearing stresses in beams. *Prereq.* 02.411 or 02.611.

02.615 Stress Analysis B (4 cl., 4 q.h.)
Determinate and indeterminate beam deflections and reactions by integration and area moment methods. Torsional stresses and strains; power transmission; eccentric loads on struts, beams, riveted and welded joints; combined stresses; principal stresses; Mohr's circle theories of failure. *Prereq.* 02.414 or 02.614.

02.616 Stress Analysis C (4 cl., 4 q.h.)
Curved beams; nonsymmetrical bending of beams; shear-center and shear stresses on thin sections; composite beams. Columns; energy absorption and resilience; inertial stresses, impact loading; deflection of beams by energy methods. Bolted fastenings. *Prereq.* 02.415 or 02.615.

02.619 Mechanics (4 cl., 4 q.h.)
A mechanics course for nonmechanical students. *Prereq.* 10.420 or 10.620, 11.417 or 11.617.

02.621 Thermodynamics A (4 cl., 4 q.h.)

General theory of heat and matter; laws of thermodynamics; energy-transformation principles and availability of energy; properties and processes for pure substances and ideal gases. Thermodynamic properties and processes of liquids and vapors; tables and charts; mixtures of fluids; vapor cycles. *Prereq.* 11.418 or 11.618.

02.622 Thermodynamics B (4 cl., 4 q.h.)

Theory of vapor engines and analysis of types of actual engines using compression of gases and vapors; internal combustion engines. Theory of gas and vapor flow through orifices and nozzles. Design and performance of steam and gas turbines; spark-ignition and compression-ignition engine design and performance. Fan performance. *Prereq.* 02.421 or 02.621.

02.623 Refrigeration & Air Conditioning (4 cl., 4 q.h.)

Air conditioning principles, including psychometrics and heat pumps. Calculation of heating and cooling loads in accordance with A.S.H.R.A.E. practices. Principles of gas compression; analysis of vapor compression; refrigeration systems; low-temperature refrigeration cycles; and absorption refrigeration systems. *Prereq.* 02.422 or 02.622.

02.630 Heat Transfer (4 cl., 4 q.h.)

The primary modes of heat transfer; thermal conductivity; thermal conductance/resistance concept; thermal-electrical analogy; combined heat transfer mechanisms, basic equations of conduction; analytical solutions of various steady state conduction problems. Dimensional analysis and similarity considerations; natural and forced convection; hydrodynamic and thermal boundary layers; black body radiation; Kirchhoff's law; emissivity and absorptivity; radiation between simple bodies; numerical methods. Log mean temperature differences; overall heat transfer coefficients; heat exchanger effectiveness; tubular exchanger design; regenerative and evaporative heat exchangers; heat transfer engineering problems. *Prereq.* 02.422 or 02.622.

02.631 Materials A (4 cl., 4 q.h.)

Lectures on: fundamental metallic structures; general metallurgical information covering theoretical aspects of properties; testing and failure of metals; supplemented by visual aids. Lectures on: alloying and hardening of metals; refinement of metals; equilibrium diagrams; characteristics of engineering metals; principles of metal fabrication.

02.632 Materials B (4 cl., 4 q.h.)

Lectures on: inorganic materials, i.e., polymers, glasses, ceramics, cements, wood, and materials having important electrical and magnetic properties; also a summary of the most up-to-date applications for the fabrication and uses of both metals and nonmetals. Structures of metals; imperfections; phase diagrams; effect of temperature on structure and properties of metals (annealing, recrystallization, recovery, precipitation, diffusion); strengthening mechanisms; mechanical properties of nonferrous metals.

Laboratory: experiments in preparation of samples, selection, polishing, and etching, examination of nonferrous metals; use of the microscope; linear analysis; construction of cooling curves; and simple binary phase diagrams. *Prereq.* 02.431 or 02.631.

02.633 Applied Metallurgy (4 cl., 4 q.h.)

Lectures on: mechanical properties of ferrous metals, the iron carbon diagram, high-temperature alloys, hardening methods, impact tests, effects of environment on metals;

manufacturing processes; methods of fabrication; limitations on the use of different materials and processes; casting, welding, cutting, drawing, powder metallurgy.

Laboratory: experiments on analysis of stress-strain diagrams of iron and steel, heat treatment of steels, surface corrosion, tempering and drawing, use of metallograph and analysis of the results. Experiments in cold rolling, swaging, drawing of nonferrous metals and the analysis of the results. Tension, shear, fatigue, and machinability tests on ferrous metals. *Prereq.* 02.432 or 02.632.

02.643 Fluid Mechanics A (4 cl., 4 q.h.)

Hydrostatics, principles governing fluids at rest; pressure measurement; hydrostatic forces on submerged areas and objects; simple dams; fluids in moving vessels; hoop tension. Fluid flow in pipes under pressure; fluid energy, power and friction loss; Bernoulli's Theorem; flow measurement. *Prereq.* 02.412 or 02.612.

02.644 Fluid Mechanics B (4 cl., 4 q.h.)

Pipe networks and reservoir systems; flow in open channels; uniform flow; energy, friction loss, minor losses, velocity distribution, alternate stages of flow, critical flow; nonuniform flow; accelerated and retarded flow; hydraulic jump and waves. *Prereq.* 02.443 or 02.643.

02.651 Mechanical Vibrations (4 cl., 4 q.h.)

Elements of vibrating systems, one degree of freedom (undamped free and forced vibration from Newton's law of motion and energy methods); natural frequencies; damped free and forced vibration; impedance and mobility, systems with more than one degree of freedom; influence coefficients. Lagrange's equations, generalized coordinates, vibration absorber. *Prereq.* 02.413 or 02.613.

02.652 Experimental Stress Analysis (4 cl., 4 q.h.)

Theory and experimentation showing the application of extensometers and electrical strain gauges as transducers in the field of experimental stress and strain analysis. Theory and laboratory practice on photoelastic methods as applied to classical model analysis and modern coating analysis. *Prereq.* 02.415 or 02.615.

02.673 Measurement & Analysis Laboratory (3 lab., 2 q.h.)

Experimental procedures for the collection and analysis of data by graphical and numerical methods, including computer applications, report writing that draws conclusions which are relative to accuracy, precision, true values, and measured values as they are related to basic mechanical measuring instruments for length, area, volume, specific gravity, pressure, temperature, and time as these parameters are utilized in making mechanical measurements. *Prereq.* 02.414 or 02.614, 06.400 or 06.600, 10.422 or 10.622, 11.419 or 11.619.

02.674 Technology Laboratory A (3 lab., 2 q.h.)

Experimental procedures to determine mechanical properties of materials under tensile, compressive, torsional, direct shear, flexural, impact, fatigue, and creep loading conditions as they are affected by environmental conditions that are normal and abnormal; also as they are affected by homogeneity, nonhomogeneity, isotropy, and nonisotropy. *Prereq.* 02.473 or 02.673, 02.415 or 02.615, 02.431 or 02.631, or concurrently.

02.675 Technology Laboratory B (3 lab., 2 q.h.)

Experimental procedures to determine the physical properties of incompressible fluids, measure the flow rates and velocities utilizing pitot tubes, orifice plates, venturii meter,

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and weirs flow meters, U tube differential manometers, and piezometers as the fluid flows through open channels, partially filled conduits, conduits under pressure, pipe networks, turbines, and pumps. *Prereq.* 02.473 or 02.673, 02.443 or 02.643, or concurrently.

02.676 Technology Laboratory C (3 lab., 2 q.h.)

Basic thermodynamic relationships; experimental procedures to examine the flow of compressible fluids and steam; examine the energy conversion of a fuel into a working substance and the related heat transfer mechanisms. Operating characteristics of thermal generators, engines, and compressors. *Prereq.* 02.473 or 02.673, 02.422 or 02.622, or concurrently.

02.677 Technology Laboratory D (3 lab., 2 q.h.)

Experimental procedures to examine the operating characteristics and efficiencies of internal combustion engines, brake horsepower, indicated horsepower, mean effective pressure, fuel consumption, torque, ignition timing, manifold pressure, and compression ratios and internal engines as energy conversion systems; energy conversion of fuels. *Prereq.* 02.476 or 02.676, 02.422 or 02.622, 02.430 or 02.630, or concurrently.

02.678 Technology Laboratory E (3 lab., 2 q.h.)

Experimental procedures of a project nature to examine refrigeration, air conditioning, and heating pump cycles. A project of analytical, design, or experimental nature. Experiments of advanced or specialized nature. *Prereq.* 02.473 or 02.673, 02.423 or 02.623, 02.430 or 02.630.

02.679 Power Generation (4 cl., 4 q.h.)

Basic power generation cycles; gas turbine cycles; effects of combustor temperature, intercooling, etc., on cycle performance; Rankine regenerative cycles; effects of steam temperature, pressure, number of feedwater heaters, etc., upon performance; steam generation equipment: boilers, reactors.

Fossil fuel characteristics and effects on boiler design; combustion analysis; draft calculations; axial and centrifugal fan performance characteristics; pump design and performance considerations; heat exchanger design considerations.

Applications of principles of economics to cycle and performance considerations; use of load curves; economic considerations of heat rate; economics of equipment selection; study of auxiliary equipment, such as precipitators and flue gas desulfurization systems. *Prereq.* 02.422, 02.622, or 02.678.

02.680 Mechanical Design A (4 cl., 4 q.h.)

Introduction to mechanical design, the design process, design factors, creativity, optimization, human factors, value engineering. These principles discussed and developed in an introductory manner through simple design projects.

Principles of design, properties and selection of materials; stress concentrations; strength under combined stresses; theories of failure; impact and fluctuating and repeated loads. *Prereq.* 02.415 or 02.615 or 02.431 or 02.631.

02.681 Mechanical Design B (4 cl., 4 q.h.)

Stresses; deformation and design of fasteners, screws, joints, springs, and bearings, lubrication and journal bearings.

Stresses and power transmission of spur, bevel, and worm gear; shaft design; clutches and brakes. *Prereq.* 02.480 or 02.680.

ELECTRICAL ENGINEERING TECHNOLOGY**03.301 Circuit Theory I** (2 cl., 2 q.h.)

Ohm's law; Kirchhoff's current and voltage laws; equivalent resistances and sources; mesh and nodal analysis; network theorems; and power relations, all with respect to direct currents. *Prereq.* 10.620, 11.619.

03.302 Circuit Theory II (2 cl., 2 q.h.)

Energy storage; singularity functions; response of R, L, and C elements to singularities. *Prereq.* 03.301, 10.621, or concurrently.

03.303 Circuit Theory III (2 cl., 2 q.h.)

Complex algebra; phasors; frequency domain; mutual inductance; transformers; steady-state a-c theory; driving point and transfer impedances; power and energy in a-c circuits. *Prereq.* 03.451 or 03.651.

03.304 Circuit Theory IV (2 cl., 2 q.h.)

Laplace transforms; partial fraction expansion; Laplace transform techniques applied to the solution of RLC networks. *Prereq.* 03.303.

03.305 Circuit Theory V (2 cl., 2 q.h.)

Consideration of balanced and unbalanced polyphase power circuits; symmetrical components; harmonic analysis. *Prereq.* 03.452 or 03.652.

03.330 Microwave Measurements (2 cl., 2 q.h.)

A discussion of basic microwave measurement techniques, including continuous wave versus swept systems; analysis of detectors, insertion loss, attenuators, filters, return loss, couplers, insulators, amplifiers, audative devices. *Prereq.* 03.429 or 03.629.

03.341 Power and Controls Laboratory I (2½ lab., 2 q.h.)

These experiments introduce the student to standard laboratory measurement equipment, including voltmeter, ammeters, oscilloscopes, and frequency counters as well as data-taking methods and report writing. Devices investigated include diodes, bipolar transistors, field effect devices, silicon control rectifiers, unijunction transistor, power supplies, regulators, and various types of feedback transistor amplifiers. *Prereq.* 03.430 or 03.630.

03.342 Power and Controls Laboratory II (2½ lab., 2 q.h.)

Experiments with characteristics of DC motors and generators, single- and multiple-phase transformers, induction motors, synchronous motors, and 3-phase power measurements. *Prereq.* 03.341.

03.343 Power and Controls Laboratory III (2½ lab., 2 q.h.)

Experiments with self-synchronous devices such as control transformers, transmitters and receivers, AC and DC servomotors, open and closed loop response of servo mechanisms and stepping motors. *Prereq.* 03.342.

03.349 Advanced Electronics Laboratory IV (2½ lab., 2 q.h.)

Electronic engineering exercises selected from the following topics: transistor amplifier design, operational amplifiers, analog computation, Fourier optics, acoustics, and micro-waves. *Prereq.* 03.429 or 03.629.

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03.350 Advanced Electronics Laboratory V (2½ lab., 2 q.h.)

Design projects laboratory. Students will be directed in design of such projects as motor speed control, DC-DC converter, high-current pulse amplifiers, etc. *Prereq.* 03.349.

03.381 Linear Active Circuit Design I (2 cl., 2 q.h.)

Effects of feedback on impedance levels, frequency response, and distortion. Use of block diagram algebra and computation of transfer functions, frequency response. Stability of feedback circuits, Nyquist, Bode, and Nichols plots. Applications of Op-Amp circuits in integrators, differentiators, and active filters. *Prereq.* 03.413 or 03.613.

03.382 Linear Active Circuit Design II (2 cl., 2 q.h.)

Building blocks for multistage amplifiers. Analysis of differential amplifier stages, drifts, offset, CM rejection ratio. High-frequency behavior of transistors. Frequency response of multistage transistor amplifiers. Compensation techniques in feedback amplifiers. *Prereq.* 03.381.

03.383 Linear Active Circuit Design III (2 cl., 2 q.h.)

Applications of Op-Amps. Function generators, comparators, sample and hold D/A, A/D converters, oscillators, phase locked loops. Power amplifiers class A, B, AB, and C. Thermal analysis of power circuits. Switching amplifiers. *Prereq.* 03.382.

03.396 Basic Optics for instrumentation (2 cl., 2 q.h.)

Provides the necessary background for the two instrumentation courses listed below. Includes basic topics in geometrical and physical optics. No previous background in optics is assumed. Topics included are: Gaussian optics, fundamental laws of image formation, basic elements of optical design, scalar wave theory, interference and diffraction, polarization, basics of coherent (laser) and noncoherent optics. *Prereq.* 10.408 or 10.608 and 11.419 or 11.619.

03.397 Optical Instrumentation I (2 cl., 2 q.h.)

Treats the classical image-forming instruments (telescopes, microscopes, etc.) as components of optical systems. Includes magnification, aberrations, resolution criteria, photometry, compatibility of system components, and optimization of systems. Topics in coherent imaging, such as phase contrast and holography. *Prereq.* 03.396.

03.398 Optical Instrumentation II (2 cl., 2 q.h.)

The basic nonimage-forming systems used for analysis control and metrology. Includes spectroscopy, interferometry (classical and holographic), electron-ion optical, and X-ray systems. *Prereq.* 03.397.

03.410 Electrical Measurements (4 cl., 4 q.h.)

(Day Curriculum)

Standards of measurements, dimensional analysis, errors and measurement of dispersed data, discrete and continuous variables, binomial distribution, normal distribution, guaranteed error, methods of resistance measurements, digital voltmeters and analog to digital conversion, voltage references, potentiometers and a.c. bridges. *Prereq.* 03.453 or 03.653.

03.411 Electronics I (4 cl., 4 q.h.)

(Day Curriculum)

Semiconductor diodes and applications, transistor biasing techniques, graphical analysis of basic amplifiers, d.c. and a.c. load lines. *Prereq.* 03.452 or 03.652.

03.412 Electronics II (4 cl., 4 q.h.) (Day Curriculum)
 Small-signal, low-frequency transistor models, gains, and impedances at midband, frequency effects in transistor circuits, multistage circuits, transistors used as current sources. *Prereq.* 03.411 or 03.611.

03.413 Electronics III (4 cl., 4 q.h.) (Day Curriculum)
 Review of Bode plots, transistor circuits at low and high frequencies, feedback, operational amplifiers, differential amplifiers, applications. *Prereq.* 03.412 or 03.612.

03.414 Pulse & Digital I (4 cl., 4 q.h.) (Day Curriculum)
 Switching characteristics of semiconductor devices; wave generation and shaping, using combinations of passive and integrated circuit components; comparators, hysteresis, and the dual ramp analog to digital converter-voltmeter circuits; voltage to frequency conversion. *Prereq.* 03.411 or 03.611.

03.415 Pulse & Digital II (4 cl., 4 q.h.) (Day Curriculum)
 Digital operations; logic statements and theorems; minimization of logic functions; logic gates and the characteristics of the integrated logic families; flip-flop counters and registers; introduction to sequential circuit design; sample and hold circuits; analog to digital conversion. *Prereq.* 03.414 or 03.614.

03.417 Principles of Communication Systems I (4 cl., 4 q.h.) (Day Curriculum)
 Signal analysis using Fourier methods; noise in communication systems; frequency selective amplifiers including wideband; transistor power amplifiers AF and RF; oscillators; signal sources and applications. *Prereq.* 03.413 or 03.613.

03.418 Principles of Communication Systems II (4 cl., 4 q.h.) (Day Curriculum)
 Basic theory of amplitude, frequency, phase and pulse code modulated systems; analysis of modulating and demodulating circuits; carrier systems using SSB; system block and level diagrams; logic control circuits in communication systems; modems. *Prereq.* 03.417 or 03.617.

03.419 Principles of Communication Systems III (4 cl., 4 q.h.) (Day Curriculum)
 Fundamentals of digital communications; sampling requirements; analog to digital conversion methods; system capacity and bandwidth; comparison of practical digital systems PAM, PCM, PFM, PWM; time and frequency division multiplexing; data decoding; selected examples from telemetry and computer links. *Prereq.* 03.418 or 03.618.

03.420 Electricity and Electronics I (4 cl., 4 q.h.) (Day Curriculum)
 Introduction to circuit analysis, resistive networks, periodic excitation function, steady state a-c circuits; the physical foundations of electronics and the physical operation of electronic devices. (This course is not open to Electrical Engineering Technology majors.) *Prereq.* 10.420 or 10.620, 11.419 or 11.619.

03.421 Electricity and Electronics II (4 cl., 4 q.h.) (Day Curriculum)
 Single-stage electronic circuits, magnetic circuits and transformers, electro mechanical energy conversion, d-c machines, a-c machines. (This course is not open to Electrical Engineering Technology majors.) *Prereq.* 03.420 or 03.620.

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03.423 Electronics Laboratory (3 lab., 2 q.h.) (Day Curriculum)

Experiments dealing with laboratory equipment (meters and oscilloscopes) techniques; junction and field-effect transistor characteristics; vacuum and semiconductor diodes; power supplies, including the regulated type; silicon controlled rectifiers; resistance-coupled amplifiers using transistors, including feedback methods. *Prereq.* 03.412 or 03.612, or concurrently.

03.424 Circuits Laboratory I (3 lab., 2 q.h.) (Day Curriculum)

Experimentation in electronic circuit theory utilizing various measurement techniques. Instrumentation verification of circuit theorems; response of circuits to steps and impulses; oscilloscope theory and applications. *Prereq.* 03.451 or 03.651.

03.425 Circuits Laboratory II (3 lab., 2 q.h.) (Day Curriculum)

Further experimentation in electrical circuits and measurement techniques. Experiments include response of circuits to steps and impulses, nonlinear devices, terminal characteristics of active devices, log modulus plots, network parameters, and synthesis. Fourier analysis and synthesis. *Prereq.* 03.424 or 03.624.

03.427 Advanced Electronics Laboratory I (3 lab., 2 q.h.) (Day Curriculum)

Experiments dealing with the use of oscilloscopes, the examination of transistor audio amplifiers, push-pull amplifiers, drivers, pulse and video amplifiers, transients and wave-shaping circuits, audio frequency oscillators, and the study of operational amplifiers. *Prereq.* 03.423 or 03.623.

03.428 Advanced Electronics Laboratory II (3 lab., 2 q.h.) (Day Curriculum)

Experiments dealing with the modulation of a class C amplifier, the diode detector, basic timing circuits, RF and crystal oscillators, astable multivibrators, logic gates, flip-flops, binary adders, registers and counters; active filters, frequency modulation detectors, and analog-to-digital and digital-to-analog conversion. *Prereq.* 03.427 or 03.627.

03.429 Advanced Electronics Laboratory III (3 lab., 2 q.h.) (Day Curriculum)

Spectral studies of FM and PM waves, amplitude limiters; the balanced modulators and single sideband generators; integrated circuit timers and monolithic random access memory; monolithic phase-locked loop as well as a series of microwave experiments and a series of digital experiments. *Prereq.* 03.428 or 03.628.

03.430 Energy Conversion (4 cl., 4 q.h.) (Day Curriculum)

Generalized theory of rotating energy conversion devices; steady-state operation of the multiply-excited direct-current machine; control of speed; special machines; transformers; steady-state considerations of induction and synchronous machines; generalized machine and circuit model; Laplace transform techniques applied to the analysis of dynamic operating modes of rotating machines. *Prereq.* 03.453 or 03.653 and 10.422 or 10.622.

03.437 Distributed Systems (4 cl., 4 q.h.) (Day Curriculum)

Radiation, transmission, and reception of electromagnetic waves; distributed-line constants and traveling waves of transmission lines; differential equations of the uniform line. *Prereq.* 10.422 or 10.622 and 11.419 or 11.619.

03.451 Circuits Analysis I (4 cl., 4 q.h.) (Day Curriculum)

Ohm's law, Kirchhoff's current and voltage laws, equivalent resistances and sources, mesh and modal analysis, network theorems, two-port networks and power relations—

all with respect to direct currents; energy storage, singularity functions, response of R, L, and C elements to singularities. *Prereq.* 10.420 or 10.620 and 11.419 or 11.619.

03.452 Circuits Analysis II (4 cl., 4 q.h.) (Day Curriculum)

Complex algebra, phasors, frequency domain, mutual inductance, transformers, steady-stage a-c theory, driving point and transfer impedances, power and energy in a-c circuits; Laplace transforms; partial fraction expansion; Laplace transform techniques applied to the solution of RLC networks. *Prereq.* 03.451 or 03.651.

03.453 Circuits Analysis III (4 cl., 4 q.h.) (Day Curriculum)

Application of differential equations to the solutions of linear, time-invariant electrical networks; introduction to singularity functions, convolution, and time domain transient analysis; network topology and duality; introduction to the methods of transformation calculus and complex frequency concepts. *Prereq.* 03.452 or 03.652.

03.454 Circuits Analysis IV (4 cl., 4 q.h.) (Day Curriculum)

Signal analysis in the frequency domain; Fourier series; Fourier and Laplace transform methods; a varied selection of circuit problems is solved using Laplace transforms and related theorems. *Prereq.* 03.453 or 03.653.

03.460 Engineering Analysis I (4 cl., 4 q.h.) (Day Curriculum)

Linear algebra and its application to circuit equations; solution of linear differential equations including an introduction to Laplace transforms. *Prereq.* 10.422 or 10.622 and 03.452 or 03.652.

03.462 Basic Power Systems I (4 cl., 4 q.h.) (Day Curriculum)

Consideration of power transmission lines; line constants; current voltage and power relations; introduction to electric-power distribution loads, feeders, and substations; application of matrices. *Prereq.* 03.454 or 03.654.

03.463 Basic Power Systems II (4 cl., 4 q.h.) (Day Curriculum)

Consideration of symmetrical and unsymmetrical faults; protective devices—application and coordination; power flow in electric circuits; steady-state power limitations of systems; voltage regulation theory and application. *Prereq.* 03.462 or 03.662.

03.464 Basic Power Systems III (4 cl., 4 q.h.) (Day Curriculum)

Computer applications to power systems with emphasis on load-flow studies; basic ideas of systems planning, short-circuit studies and system stability. *Prereq.* 03.463 or 03.663.

03.470 Digital Computers (4 cl., 4 q.h.) (Day Curriculum)

Introduction to the field of digital computer design. Topics include general computer organization, number systems and number representations, design characteristics of major computer units, Boolean Algebra applications to computer design. *Prereq.* 03.411 or 03.611.

03.471 Digital Computers II (4 cl., 4 q.h.) (Day Curriculum)

Examination of microprocessor architecture and organization. Study of the machine language and assembly coding of an industry-accepted microprocessor. A suitable topic

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selected from the current literature by the instructor will be analyzed. Assembly language coding problems will be assigned. *Prereq.* 03.470 or 03.670.

03.477 Control Engineering I (4 cl., 4 q.h.) (Day Curriculum)

Analysis of linear servomechanisms under both transient and steady-state conditions; signal flow graphs; Laplace transforms used in the formulation of block diagrams and transfer function. *Prereq.* 03.454 or 03.654 and 10.422 or 10.622.

03.478 Control Engineering II (4 cl., 4 q.h.) (Day Curriculum)

System stability; root locus techniques; treatment of Nyquist criteria and Bode diagram methods for systems evaluation. *Prereq.* 03.477 or 03.677.

03.490 Optical Instrumentation (4 cl., 4 q.h.) (Day Curriculum)

Telescopes, microscopes, etc., as optical system components. Includes magnification, aberrations, resolution criteria, photometry. Compatibility of system components and optimization of systems. The basic nonimage-forming systems used for analysis control and metrology. *Prereq.* 10.408 or 10.608 and 11.419 or 11.619.

03.498 Special Problems In Electrical Engineering Technology (2 q.h.)

Theoretical or experimental work under individual faculty supervision. *Prereq.* *Consent of department chairperson.*

03.499 Special Problems in Electrical Engineering Technology (4 q.h.)

Theoretical or experimental work under individual faculty supervision. *Prereq.* *Consent of department chairperson.*

03.531 Digital Signal Processing 1 (2 cl., 2 q.h.)

Introduction to digital signal processing discussing sampling, transform and discrete Fourier transform. *Prereq.* 03.454 or 03.654 and 06.400 or 06.600.

03.532 Digital Signal Processing 2 (2 cl., 2 q.h.)

Discrete systems are taken up with a comparison of continuous and digital filter design. *Prereq.* 03.531.

03.533 Digital Signal Processing 3 (2 cl., 2 q.h.)

Frequency domain design is covered with linear phase FIR filters, fast Fourier transforms, continuing with convolution and correlation. *Prereq.* 03.352.

03.598 Special Problems in Electrical Engineering Technology (2 q.h.)

Theoretical or experimental work under individual faculty supervision. *Prereq.* *Consent of department chairperson.*

03.599 Special Problems in Electrical Engineering Technology (4 q.h.)

Theoretical or experimental work under individual faculty supervision. *Prereq.* *Consent of department chairperson.*

03.610 Electrical Measurements (4 cl., 4 q.h.)

Standards of measurements, dimensional analysis, errors and measurement of dispersed data, discrete and continuous variables, binomial distribution, normal distribution, guaranteed error, methods of resistance measurements, digital voltmeters and analog to

digital conversion, voltage references, potentiometers and a.c. bridges. *Prereq.* 03.453 or 03.653.

03.611 Electronics I (4 cl., 4 q.h.)

Semiconductor diodes and applications, transistor biasing techniques, graphical analysis of basic amplifiers, d.c. and a.c. load lines. *Prereq.* 03.452 or 03.652.

03.612 Electronics II (4 cl., 4 q.h.)

Small-signal, low-frequency transistor models, gains and impedances at midband, frequency effects in transistor circuits, multistage circuits, transistors used as current sources. *Prereq.* 03.411 or 03.611.

03.613 Electronics III (4 cl., 4 q.h.)

Review of Bode plots, transistor circuits at low and high frequencies, feedback, operational amplifiers, differential amplifiers, applications. *Prereq.* 03.412 or 03.612.

03.614 Pulse & Digital I (4 cl., 4 q.h.)

Switching characteristics of semiconductor devices; wave generation and shaping using combinations of passive and integrated circuit components; comparators, hysteresis, and the dual ramp analog to digital converter-voltmeter circuits; voltage to frequency conversion. *Prereq.* 03.411 or 03.611.

03.615 Pulse & Digital II (4 cl., 4 q.h.)

Digital operations; logic statements and theorems; minimization of logic functions; logic gates and the characteristics of the integrated logic families; flip-flop counters and registers; introduction to sequential circuit design; sample and hold circuits; analog to digital conversion. *Prereq.* 03.414 or 03.614.

03.617 Principles of Communication Systems I (4 cl., 4 q.h.)

Signal analysis using Fourier methods; noise in communication systems; frequency selective amplifiers, including wideband; transistor power amplifiers AF and RF; oscillators; signal sources, and applications. *Prereq.* 03.613 or 03.413.

03.618 Principles of Communication Systems II (4 cl., 4 q.h.)

Basic theory of amplitude, frequency, phase and pulse code modulated systems; analysis of modulating and demodulating circuits; carrier systems using SSB; system block and level diagrams; logic control circuits in communication systems; modems. *Prereq.* 03.417 or 03.617.

03.619 Principles of Communication Systems III (4 cl., 4 q.h.)

Fundamentals of digital communications; sampling requirements; analog to digital conversion methods; system capacity and bandwidth; comparison of practical digital systems PAM, PCM, PFM, PWM; time and frequency division multiplexing; data decoding; selected examples from telemetry and computer links. *Prereq.* 03.618 or 03.418.

03.620 Electricity and Electronics I (4 cl., 4 q.h.)

Introduction to circuit analysis, resistive networks, periodic excitation function, steady state a-c circuits; the physical foundations of electronics and the physical operation of electronic devices. (This course is not open to Electrical Engineering Technology majors.) *Prereq.* 10.620 or 10.420 and 11.619 or 11.419.

03.621 Electricity and Electronics II (4 cl., 4 q.h.)

Single-stage electronic circuits, magnetic circuits and transformers, electro-mechanical energy conversion, d-c machines, a-c machines. (This course is not open to Electrical Engineering Technology majors.) *Prereq.* 03.620 or 03.420.

03.623 Electronics Laboratory (3 lab., 2 q.h.)

Experiments dealing with laboratory equipment (meters and oscilloscopes) techniques; junction and field-effect transistor characteristics; vacuum and semiconductor diodes; power supplies, including the regulated type; silicon controlled rectifiers; resistance-coupled amplifiers using transistors, including feedback methods. *Prereq.* 03.612 or 03.412, or concurrently.

03.624 Circuits Laboratory I (3 lab., 2 q.h.)

Experimentation in electronic circuit theory utilizing various measurement techniques. Instrumentation verification of circuit theorems; response of circuits to steps and impulses; oscilloscope theory and applications. *Prereq.* 03.651 or 03.451.

03.625 Circuits Laboratory II (3 lab., 2 q.h.)

Further experimentation in electrical circuits and measurement techniques. Experiments include response of circuits to steps and impulses, nonlinear devices, terminal characteristics of active devices, log modulus plots, network parameters and synthesis. Fourier analysis and synthesis. *Prereq.* 03.624 or 03.424.

03.627 Advanced Electronics Laboratory I (3 lab., 2 q.h.)

Experiments dealing with the use of oscilloscopes, the examination of transistor audio amplifiers, push-pull amplifiers, drivers, pulse and video amplifiers, transients and wave-shaping circuits, audio frequency oscillators, and the study of operational amplifiers. *Prereq.* 03.623 or 03.423.

03.628 Advanced Electronics Laboratory II (3 lab., 2 q.h.)

Experiments dealing with the modulation of a class C amplifier, the diode detector, basic timing circuits, RF and crystal oscillators, astable multivibrators, logic gates, flip-flops, binary adders, registers and counters; active filters, frequency modulation detectors, and analog-to-digital and digital-to-analog conversion. *Prereq.* 03.627 or 03.427.

03.629 Advanced Electronics Laboratory III (3 lab., 2 q.h.)

Spectral studies of FM and PM waves, amplitude limiters; the balanced modulators and single sideband generators; integrated circuit timers and monolithic random access memory; monolithic phase-locked loop as well as a series of microwave experiments and a series of digital experiments. *Prereq.* 03.628 or 03.428.

03.630 Energy Conversion (4 cl., 4 q.h.)

Generalized theory of rotating energy conversion devices; steady-state operation of the multiply-excited direct-current machine; control of speed; special machines; transformers; steady-state considerations of induction and synchronous machines; generalized machine and circuit model; Laplace transform techniques applied to the analysis of dynamic operating modes of rotating machines. *Prereq.* 03.653 or 03.453 and 10.622 or 10.422.

03.637 Distributed Systems (4 cl., 4 q.h.)

Radiation, transmission, and reception of electromagnetic waves; distributed-line constants and traveling waves of transmission lines; differential equations of the uniform line. *Prereq.* 10.622 or 10.422 and 11.619 or 11.419.

03.651 Circuits Analysis I (4 cl., 4 q.h.)

Ohm's law, Kirchhoff's current and voltage laws, equivalent resistances and sources, mesh and modal analysis, network theorems, two-port networks and power relations—all with respect to direct currents; energy storage, singularity functions, responses of R, L, and C elements to singularities. *Prereq.* 10.620 or 10.420 and 11.619 or 11.419.

03.652 Circuits Analysis II (4 cl., 4 q.h.)

Complex algebra, phasors, frequency domain, mutual inductance, transformers, steady-state a-c theory, driving point and transfer impedances, power and energy in a-c circuits; Laplace transforms; partial fraction expansion; Laplace transform techniques applied to the solution of RLC networks. *Prereq.* 03.651 or 03.451.

03.653 Circuits Analysis III (4 cl., 4 q.h.)

Application of differential equations to the solutions of linear, time-invariant electrical networks; introduction to singularity functions, convolution, and time domain transient analysis; network topology and duality; introduction to the methods of transformation calculus and complex frequency concepts. *Prereq.* 03.652 or 03.452.

03.654 Circuits Analysis IV (4 cl., 4 q.h.)

Signal analysis in the frequency domain; Fourier series; Fourier and Laplace transform methods; a varied selection of circuit problems is solved using Laplace transforms and related theorems. *Prereq.* 03.653 or 03.453.

03.662 Basic Power Systems I (4 cl., 4 q.h.)

Consideration of power transmission lines; line constants; current voltage and power relations; introduction to electric-power distribution loads, feeders, and substations; application of matrices. *Prereq.* 03.654 or 03.454.

03.663 Basic Power Systems II (4 cl., 4 q.h.)

Consideration of symmetrical and unsymmetrical faults; protective devices—application and coordination; power flow in electric circuits; steady-state power limitations of systems; voltage regulation theory and application. *Prereq.* 03.662 or 03.462.

03.664 Basic Power Systems III (4 cl., 4 q.h.)

Computer applications to power systems with emphasis on load-flow studies; basic ideas of systems planning, short-circuit studies and system stability. *Prereq.* 03.663 or 03.463.

03.670 Digital Computers I (4 cl., 4 q.h.)

Introduction to the field of digital computer design. Topics include general computer organization, number systems and number representations, design characteristics of major computer units. Boolean Algebra applications to computer design. *Prereq.* 03.611 or 03.411.

03.671 Digital Computers II (4 cl., 4 q.h.)

Examination of microprocessor architecture and organization. Study of the machine language and assembly coding of an industry-accepted microprocessor. A suitable topic selected from the current literature by the instructor will be analyzed. Assembly language coding problems will be assigned. *Prereq.* 03.670 or 03.470.

03.677 Control Engineering I (4 cl., 4 q.h.)

Analysis of linear servomechanisms under both transient and steady-state conditions; signal flow graphs; Laplace transforms used in the formulation of block diagrams and transfer function. *Prereq.* 03.654 or 03.454 and 10.622 or 10.422.

03.678 Control Engineering II (4 cl., 4 q.h.)

System stability; root locus techniques; treatment of Nyquist criteria and Bode diagram methods for systems evaluation. *Prereq.* 03.677 or 03.477.

03.690 Optical Instrumentation (4 cl., 4 q.h.)

Telescopes, microscopes, etc., as optical system components. Includes magnification, aberrations, resolution criteria, photometry. Compatibility of system components and optimization of systems. The basic nonimage-forming systems used for analysis control and metrology. *Prereq.* 10.608 or 10.408 and 11.619 or 11.419.

CHEMICAL ENGINEERING TECHNOLOGY

04.381 Nuclear Technology I (2 cl., 2 q.h.)

Atomic and nuclear structure; discovery and nature of radioactivity; nuclear instrumentation for particle detection, monitoring, and experimentation; supplementary laboratory experiments. *Prereq.* 10.623, 11.619.

04.382 Nuclear Technology II (2 cl., 2 q.h.)

Nuclear reactions and energy; induced nuclear transformations; neutron properties; radiological safety—the hazards, problems, and protection; applications of radionuclides; supplementary laboratory experiments. *Prereq.* 04.381.

04.383 Nuclear Technology III (2 cl., 2 q.h.)

The fission process and its applications; nuclear reactors—their classification, design, and application; nuclear fuel processing; radioactive waste disposal; supplementary laboratory experiments. *Prereq.* 04.382.

04.481 Nuclear Technology (4 cl., 4 q.h.)

(Day Curriculum)

Atomic and nuclear structure; discovery and nature of radioactivity; nuclear reactions and energy; induced nuclear transformation; neutron properties; nuclear instrumentation for particle detection, monitoring, and experimentation; the fission process and its applications; nuclear reactors—their classification, design, and application; supplementary laboratory experiments. *Prereq.* 10.422, 11.619.

INDUSTRIAL ENGINEERING TECHNOLOGY

05.660 Engineering Economy I (4 cl., 4 q.h.)

Fundamental accounting concepts and familiarization with terminology. Assets, liability, net worth. Analysis of income statement and balance sheet. Flow of funds in a firm. Sources of capital—equity, borrowed, retained earnings, depreciation and depreciation accounting, taxes. Cost of capital, time value of money, equivalence, cash flow of diagrams and tables. Development of cash flows for alternative capital expenditures, analytical methods of engineering economy, including present worth, annual cost, and rate of return. Incremental rate of return, breakeven analysis. Retirement and replacement.

05.582 Industrial Technology I (2 cl., 2 q.h.)

Concepts of methods analysis and work simplification, use of man-machine charts, principles of motion economy, human considerations in designing man-machine systems.

05.583 Industrial Technology II (2 cl., 2 q.h.)

Work measurement, techniques of measurement to include stop watch, micromotion, memomotion, work sampling and predetermined systems. Development of standard data. Establishment of standards, fatigue and delay allowances, rating techniques, incentive plans. *Prereq.* 05.582.

05.590 Engineering Probability and Statistics I (2 cl., 2 q.h.)

Algebra of events and sets. Probability measure, laws of probability. Independence, conditional probability. Random variables, discrete and continuous. Properties of random variables, including density functions, expectations, variance. *Prereq.* 10.323.

05.591 Engineering Probability and Statistics II (2 cl., 2 q.h.)

Sampling statistics. Estimation of parameters of random variables. Point and interval estimation. Hypothesis testing. Simple and composite hypothesis. One-sided and two-sided tests. Tests of measures of variances. Normal, standard deviation, F , X^2 . *Prereq.* 05.590.

COMPUTER TECHNOLOGY

09.400 Computer Programming for Engineering Technology (4 cl., 4 q.h.)

(Day Curriculum)

Introduction to the use of computers in the solution of problems using FORTRAN on interactive terminals. Students write and run programs to compute sequences, averages, etc. Other capabilities of the FORTRAN language, including DO loops, subscripted variables, and alphanumeric manipulation, matrix algebra, and numerical methods.

Prereq. 10.408 or concurrently.

09.600 Computer Programming for Engineering Technology (4 cl., 4 q.h.)

Introduction to the use of computers in the solution of problems using FORTRAN on interactive terminals. Students write and run programs to compute sequences, averages, etc. Other capabilities of the FORTRAN language, including DO loops, subscripted variables, and alphanumeric manipulation, matrix algebra, and numerical methods.

Prereq. 10.608 or concurrently.

09.601 FORTRAN Engineering Computation (4 cl., 4 q.h.)

Professional methods for solving engineering problems with FORTRAN. Students will write and run programs using the University's computer. Topics include: subprograms, scientific software packages, solution of equations, data storage, reduction and display.

Prereq. 09.600 or 09.353.

09.605 Introduction to Programming (4 cl., 4 q.h.)

A high-level structured language will be taught and used as a vehicle for implementing programs. Students will write and run programs using N.U.'s computer. Topics: using

Note: Students at suburban campuses will find it necessary periodically to come to the Boston Campus Computation Center to run their homework problems.

N.U.'s computer, flow charting, program construction, computations involving maxima and minima, arrays, simple recursion, subroutines.

09.610 FORTRAN (4 cl., 4 q.h.)

This important scientific language will be taught with engineering applications. Students will write and run FORTRAN programs using N.U.'s computer. Topics: arithmetic replacement, input, output, control and specification statements, looping, arrays, functions and subroutines. *Prereq. 09.605 or equiv.*

09.615 Pascal (A Second Language) (4 cl., 4 q.h.)

An introductory course in programming computers using the Pascal language. Students will write and run programs using the University's computer facilities. This course may not be used as a technical elective in the Computer Technology Program. *Prereq. 06.600 or equivalent.*

09.620 COBOL (4 cl., 4 q.h.)

This important business language will be taught with general applications. Students will write and run COBOL programs using N.U.'s computer. Topics: divisions, names, rules, picture clauses, verbs, input/output instructions, levels, working storage, arithmetic, corresponding, accept, display, compute, copy, update logic, table logic, redefines, search, inline, and COBOL sorts. *Prereq. 09.605 or equiv.*

09.630 Nonnumerical Algorithms (4 cl., 4 q.h.)

Data; structures, storage, manipulation, and retrieval methods. Students will write and run data manipulation programs using N.U.'s computer. Topics: stacks, queues, lists, trees, heaps, sets, graphs, hashing, searching, sorting, key processing, relational models. *Prereq. 09.605.*

09.635 Numerical Algorithms (4 cl., 4 q.h.)

Computer methods for solving mathematical problems. Students will write and run application programs using N.U.'s computer. Topics: deterministic vs. stochastic methods, random number generators, iterative vs. noniterative solutions, maxima and minima in 2 and 3 variables, curve fitting in 2 and 3 variables, integrals, trapezoidal and Simpsons rules, slopes, difference equations in 2 and 3 variables, vector and matrix algebra, simultaneous linear equations, nonlinear equations, permutations, and combinations. *Prereq. 09.610 or equiv.*

09.640 Modern Programming Techniques (4 cl., 4 q.h.)

Structured methods for developing complex computer programs. Students will develop and write sections of complex programs. Students will run programs on N.U.'s computer. Topics: top down design, hierarchy diagrams, HIPO charts, composite design, structured analysis, team programming. *Prereq. 09.605.*

09.645 Assembly Language (4 cl., 4 q.h.)

A typical microprocessor assembly language will be taught. Students will write and run homework problems using a microprocessor simulator package implemented on N.U.'s computer. Topics: binary arithmetic, instruction sets, addressing modes, code conversion, subroutines, macros, I/O. *Prereq. 09.605.*

09.650 Basic Computer Organization (4 cl., 4 q.h.)

Fundamental aspects of basic computer components. Topics: the functions and general operating characteristics of CPU's, primary/secondary and mass memory, controllers,

printers card readers terminals. What an operating system does, scheduling, monitoring, spooling, paging, system programs, virtual memory, multiprogramming, multiprocessing. *Prereq.* 09.605.

09.651 Advanced Computer Organization (4 cl., 4 q.h.)

The operating and performance characteristics of complex and special purpose components. Topics: how an operating system works, memory hierarchies, fiber optics, bubble memory, mass storage, computer networks, distributed processing, data flow, cache memory, associative memory, special purpose/parallel processors, system performance measures. *Prereq.* 09.605.

09.655 Micro Peripheral Hardware (4 cl., 4 q.h.)

The elements of microprocessor peripheral hardware and its interfacing. Students will configure microprocessor systems, using block diagrams showing relevant handshaking signals. Topics: serial and parallel I/O devices, DMA and interrupt control devices, bus arbitration, memory management units, counter timers as extensions of basic CPU functions. *Prereq.* 09.675.

09.656 Complex Peripheral Hardware (4 cl., 4 q.h.)

The interfacing and implementation of special purpose hardware. Students will configure systems, using block diagrams showing relevant handshaking signals. Topics: virtual memory, rotating media, printers, terminals, bus extension concepts, co-processors. *Prereq.* 09.655.

09.660 Industry Software (4 cl., 4 q.h.)

A survey of current commercial software packages and methods. Students will exercise commercial packages implemented on N.U.'s computer where applicable. Topics: specific packages and methods which vary from year to year to maintain currency. They will be drawn from the following general categories: data base management, scientific and statistical analysis, security and privacy, software assurance, and documentation. *Prereq.* 09.651, 09.610.

09.665 Industry Hardware (4 cl., 4 q.h.)

A survey of the latest industrial developments and trends in computer hardware. Conducted as a seminar. *Prereq.* 09.656.

09.668 Semiconductor Logic (4 cl., 4 q.h.)

A detailed analysis of the bipolar and MOS transistors in saturated and cutoff conditions. Implementation of these concepts to form basic logic and decision-making circuits. Students will convert logical expressions into hardware configuration representations. Topics: Ebers-Moll modeling, PMOS, NMOS, CMOS construction, logic families. *Prereq.* 03.652.

09.669 Computer Logic (4 cl., 4 q.h.)

An introduction to the hardware building blocks of general computers. Students will specify configurations of lower level components to achieve composite logical functions, e.g., construct a register from NAND gates. Topics: gates, flipflops, registers, decoders, ALU's, memory arrays. *Prereq.* 09.668.

09.674 Introduction to CPU Hardware (4 cl., 4 q.h.)

The internal operation of a microprocessor CPU. A black box approach is used. Students purchase and keep individual single board computers for doing homework and simulation.

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Topics: registers and timing control, programmable gate arrays, array processors as CPU models. *Prereq.* 09.645 or equiv.

09.675 CPU Hardware Architecture (4 cl., 4 q.h.)

The performance characteristics of commercially available CPU's. Students will write code for 4 bit through 32 bit processors. Topics: the characteristics of 4004, 4008, 8080, Z80, Z8000, 8086, 1802, F8, and 6800 processors, and how to use one processor in place of another. Note: the list of processors examined may vary from year to year to maintain currency. *Prereq.* 09.674.

09.680 Data Communication Methods (4 cl., 4 q.h.)

Functional and operational aspects of data communication devices and software. A black box approach will be used. Topics: modems, control units, multiplexers, concentrators, front end processors, synchronous/asynchronous/half duplex/full duplex codes and procedures, Bisynch/SDLE/HDL, BYTE and BIT protocols, error checking, point to point/multidrop/STAR/MESH/CLUSTER networks. *Prereq.* 09.610.

09.681 Operating Systems (4 cl., 4 q.h.)

The basic principles of operating system implementation. Students write and run programs to exercise elements of the University's operating system when applicable. Topics: resource, memory, processor and device management commands and strategies, I/O programming, swapping, overlays, jobs and process scheduling, and other operating systems. *Prereq.* 09.651.

09.682 Computer Graphics Programming (4 cl., 4 q.h.)

Students are introduced to generalized techniques for the computer plotting of 2 and 3 dimensional shapes. Students write and run programs using the University's computer and digital plotter. Topics: 2D transforms, 3D to 2D transforms, 3D transforms, surface representation, shading, characters, curve fitting, graphic data structures. *Prereq.* 09.610.

09.683 Data Bases (4 cl., 4 q.h.)

An introduction to data base organization structure and management. Students write and run programs exemplifying techniques developed in class on the University's computer. Topics: access methods, attributes, indices, keys, querying, searching and matching, file sets, inverted file sets, normal forms, random access. *Prereq.* 09.630.

09.684 Large System Assembly Languages (4 cl., 4 q.h.)

Typical large computer system assembly languages. Students will write and run illustrative programs on the University's computer. Topics: edit and translate instructions, macro writing, program sectioning, linking, data representation, addressing, instruction formats in BAL and VAX-11 assembler languages. *Prereq.* 09.645.

09.685 Introduction to Simulation Programming (4 cl., 4 q.h.)

Computer methods for solving simulated phenomena. Students will write and run programs implementing simulations specified by instructor. Students will not be responsible for the validity or evaluation of models except in simple cases. Topics: simple queues, multiserver queues, priorities including first in first out, last in last out, and time aging of data, simple frequency distributions, use of SIMULA, GPSS, and Standard Subroutine Library Routines. *Prereq.* 09.635.

09.686 Device System Hardware (4 cl., 4 q.h.)

A study of the principal hardware capabilities and current trends in micro computer level systems. Included are both single users and network-oriented systems. *Prereq.* 09.675.

09.687 Bit Slice Micro Computers (4 cl., 4 q.h.)

The epitome of hardware flexibility is represented by the bit slice CPU. Demonstrates the basic design ground rules common to this style of hardware design. *Prereq.* 09.655.

09.688 Micro Controllers (4 cl., 4 q.h.)

The commercial segment of micro computers has been satisfied by a variety of single chip 4 bit micros controllers. A detailed contrast/comparison will be done on several of these devices, including the IMS-1000, S2000, COPS, and PPS-4. *Prereq.* 09.674.

09.689 Single Chip Microprocessors (4 cl., 4 q.h.)

When small 8 bit intelligent devices are rewired in high volume, the single chip micro-processor in the form of the 3870, 8048, Z8, and others comes into play. An understanding of the hardware limitations of a single chip system presents the basis for this subject material. *Prereq.* 09.674.

09.690 Special Problems in Computer Technology (4 cl., 4 q.h.)

Theoretical or experimental work under individual faculty supervision. *Prereq.* Consent of department chairperson.

ENGINEERING GRAPHICS

09.464 Engineering Design Graphics IV (4 cl., 4 q.h.) (Day Curriculum)

Graphical analysis of kinematic elements; displacement, locus generators, velocity vectors, and sliding motion; simple, compound, and reverted gear trains; acceleration analysis of mechanisms such as cams and linkages; functions, scales and nomographs; introduction to self-correcting (feedback) systems. *Prereq.* 09.471.

09.470 Engineering Graphics I (4 cl., 4 q.h.) (Day Curriculum)

The study of concepts and the development of skills to present and to analyze objects and systems used in design through the principles of graphical geometric constructions, orthographic projections (multi-view, two-dimensional drawings), and the design process. Assignments will include the layout of drawings on the paper, solutions to graphical problems concerning objects and systems, and complete solutions to short problems using the design process.

09.471 Engineering Graphics II (4 cl., 4 q.h.) (Day Curriculum)

Continuation of the study of concepts and the development of skills to present and to analyze objects and systems used in design, including dimensioning, sectioning, threads, fasteners, assembly and detail drawings, as well as the design process. Assignments will require solutions to graphical problems that will require the studied graphical material and a progress report leading to the solution of a design problem. *Prereq.* 09.470.

09.472 Electrical Engineering Graphics (4 cl., 4 q.h.) (Day Curriculum)

Introduction to electronic graphics, including symbols, schematics, block and logic diagrams, production and cable drawings, military standards. A study of single- and double-

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sided printed circuit layout, integrated circuits, electro-mechanical designs, wiring, and interconnection diagrams; graphical data presentation. *Prereq.* 09.470.

09.664 Engineering Design Graphics IV (4 cl., 4 q.h.)

Graphical analysis of kinematic elements; displacement, locus generators, velocity vectors, and sliding motion; simple, compound, and reverted gear trains; acceleration analysis of mechanisms such as cams and linkages; functions, scales and nomographs; introduction to self-correcting (feedback) systems. *Prereq.* 09.671.

09.670 Engineering Graphics I (4 cl., 4 q.h.)

Introduction to engineering drawing by geometric constructions, charting, and graphs. Orthographic projection, including reading, sketching, and auxiliary views. Axonometric drawing and elements of descriptive geometry. Section and conventions.

09.671 Engineering Graphics II (4 cl., 4 q.h.)

Determination of design project. Intersections and development. Manufacturing processes and dimensioning, including true position tolerancing. Threads and fasteners. Making and reading assembly drawing. Topographical and earth work drawings as applicable to civil engineers. Case studies of engineering problems and introduction to computer-aided design. Presentation of design project. *Prereq.* 09.611.

09.672 Electrical Engineering Graphics (4 cl., 4 q.h.)

Introduction to electronic graphics, including symbols, schematics, block and logic diagrams, production and cable drawings, military standards. A study of single- and double-sided printed circuit layout, integrated circuits, electro-mechanical designs, wiring, and interconnection diagrams; graphical data presentation. *Prereq.* 09.670.

MATHEMATICS

10.316 Probability and Statistics I (2 cl., 2 q.h.)

(appropriate for both engineering and non-engineering students)

Basic tools, e.g., sets, permutations and combinations; probability and its applications; discrete and continuous random variables. *Prereq.* 10.308.

10.317 Probability and Statistics II (2 cl., 2 q.h.)

Frequency distributions and probability density functions; binomial, normal, and other distributions; central limit theorem; hypothesis testing; analysis of variance; correlation; statistical inference and estimation. Examples taken from many different fields.

Prereq. 10.316.

10.318 Probability and Statistics III (2 cl., 2 q.h.)

Contingency tables; simple linear regression; multiple regression; model building.

Prereq. 10.317.

10.324 Differential Equations I (2 cl., 2 q.h.)

Ordinary differential equations—standard types of the first order; some applications; special differential equations of the second order. *Prereq.* 10.323.

10.325 Differential Equations II (2 cl., 2 q.h.)

Linear differential equations with constant coefficients, homogeneous and nonhomogeneous; variation of parameters, simultaneous differential equations; Laplace transform.

Prereq. 10.324.

10.326 Differential Equations III (2 cl., 2 q.h.)

Continuation of Laplace transform; series and solution of differential equations by series; Fourier series; orthogonal functions. *Prereq.* 10.325.

10.351 Advanced Mathematics I (Numerical Analysis) (2 cl., 2 q.h.)

Basic methods of numerical analysis—roots by iteration; approximating polynomials and interpolation; least squares fitting; numerical integration; approximate solution of ordinary differential equations—problems employing the electronic computer. *Prereq.* 06.601 or 06.610 and 10.623.

10.352 Advanced Mathematics II (2 cl., 2 q.h.)

Introduction to partial differential equations, boundary-value problems, Sturm-Liouville systems. *Prereq.* 10.351.

10.353 Advanced Mathematics III

Special topics in analysis. *Prereq.* 10.352.

10.361 Modern Algebra I (2 cl., 2 q.h.)

Sets; binary operations; mappings; rings, integers, fields; reals, bases for computer applications; Euclidean algorithm; primes. *Prereq.* 10.608, 10.329, or 10.335.

10.362 Modern Algebra II (2 cl., 2 q.h.)

Field of complex numbers; groups; subgroups; polynomial rings; homomorphisms; isomorphisms, ideals. *Prereq.* 10.361.

10.363 Modern Algebra III (2 cl., 2 q.h.)

Vector spaces; linear transformations; dependence, independence; dimension applications to engineering, science, and business. *Prereq.* 10.362.

10.364 Modern Applied Algebra (4 cl., 4 q.h.)

Introduction to the language of abstract algebra to the following topics: graphs, finite state machines, programming languages, Boolean Algebra, lattices, coding for communication channels, and radar; look at algebraic theory of linear systems. *Prereq.* 10.361, 10.362, and 10.363.

10.404 Pre-Calculus Mathematics (4 cl., 4 q.h.) (Summer Quarter only)

Treats those topics in algebra, trigonometry, and analytical geometry which will be of greatest value to the beginning calculus student.

10.407 College Algebra and Trigonometry I (4 cl., 4 q.h.) (Day Curriculum)

Fundamental algebraic operations; complex numbers; radicals and exponents; functions; linear and quadratic equations; irrational equations; inequalities; variation; roots of polynomial equations.

10.408 College Algebra and Trigonometry II (4 cl., 4 q.h.) (Day Curriculum)

Logarithms; trigonometric functions of angles in degrees and radians; trigonometric identities and equations; right triangles; oblique triangles; complex numbers in trigonometric form; systems of equations; determinants. *Prereq.* 10.407 or 10.607.

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10.420 Calculus I (4 cl., 4 q.h.) (Day Curriculum)

Plane analytic geometry; differentiation of algebraic functions; rate, motion, maximum and minimum problems; derivations of higher order; curve sketching; basics in functions, limits, and continuity. *Prereq.* 10.408 or 10.608.

10.421 Calculus—A (4 cl., 4 q.h.) (Day Curriculum)

Applications of derivatives to curvesketching; antidifferentiation; the definite integral, with applications; calculus of nonalgebraic functions—logarithmic, exponential, and trigonometric; calculus of inverse trigonometric functions; techniques of integration; indeterminate forms; L'Hospital's rule. *Prereq.* 10.420 or 10.620.

10.422 Calculus—B (3 cl., 4 q.h.) (Day Curriculum)

Calculus of functions of several variables; partial differentiation; multiple integrals; infinite series; vector analysis; polar coordinates; vectors in a plane. *Prereq.* 10.421 or 10.621.

10.423 Differential Equations (4 cl., 4 q.h.) (Day Curriculum)

Ordinary differential equations—standard types of the first order; linear differential equations, especially with constant coefficients; Laplace transforms; series solutions of differential equations; Fourier series; and orthogonal functions. *Prereq.* 10.422 or 10.622.

10.607 College Algebra I (4 cl., 4 q.h.)

Fundamental algebraic operations; complex numbers; radicals and exponents; functions; linear and quadratic equations; irrational equations; inequalities; variation; roots of polynomial equations. *Prereq.* Math Placement Test or 10.682.

10.608 Introduction to Calculus (4 cl., 4 q.h.)

Logarithms; trigonometric functions of angles in degrees and radians; trigonometric identities and equations; right triangles; oblique triangles; complex numbers in trigonometric form; systems of equations; determinants. *Prereq.* 10.407 or 10.607.

10.620 Calculus I (4 cl., 4 q.h.)

Plane analytic geometry; differentiation of algebraic functions; rate, motion, maximum and minimum problems; derivations of higher order; curve sketching; basics in functions, limits, and continuity. *Prereq.* 10.408 or 10.608.

10.621 Calculus—A (4 cl., 4 q.h.)

Applications of derivatives to curvesketching; antidifferentiation; the definite integral, with applications; calculus of nonalgebraic functions—logarithmic, exponential, and trigonometric; calculus of inverse trigonometric functions; techniques of integration; indeterminate forms; L'Hospital's rule. *Prereq.* 10.420 or 10.620.

10.622 Calculus—B (3 cl., 4 q.h.)

Calculus of functions of several variables; partial differentiation; multiple integrals; infinite series; vector analysis; ordinary differential equations—standard types of the first order; some applications; special differential equations of the second order. *Prereq.* 10.421 or 10.621.

10.623 Calculus—C (4 cl., 4 q.h.)

Linear differential equations with constant coefficients, homogeneous and nonhomogeneous; variation of parameters, simultaneous differential equations; Laplace transform;

series and solution of differential equations by series; Fourier series; orthogonal functions.
Prereq. 10.422 or 10.622.

10.627 Mathematics I (3 q.h.)

Sets, number systems, fundamental operations of algebra, exponents, radicals, linear equations. *Prereq.* Math Placement Test, or 10.302, or 10.331.

10.628 Mathematics II (3 q.h.)

Fractional equations; inequalities; functions, relations, graphs; quadratic equations; systems of equations; ratio, proportion, variation; logarithms. *Prereq.* 10.627.

10.629 Mathematics III (3 q.h.)

Progressions; introduction to calculus; rates of change, slopes, area under a curve, maximum and minimum problems; elementary matrix algebra. *Prereq.* 10.628.

10.632 Mathematics for Business Management I (3 q.h.)

Topics in mathematics applicable to management. Logic, set theory, probability with applications. Survey of mathematical models, linear models. *Prereq.* 10.629 and 39.313, or equiv.

10.633 Mathematics for Business Management II (3 q.h.)

Linear programming problems, solution by graphing. Matrix algebra, markov chains, directed graph models, mathematics of finance. *Prereq.* 10.632.

10.634 Mathematics for Business Management III (3 q.h.)

Statistical decision theory, utility theory, theory of games, regression-based models. *Prereq.* 10.633.

10.671 Basic Mathematics I (2 cl., 2 q.h.)

This credit cannot be used in the Associate in Engineering, Associate in Science, or the Bachelor of Engineering Technology degree programs.

A review of elementary algebra; algebraic expressions and operations, equations, word problems.

10.672 Basic Mathematics II (2 cl., 2 q.h.)

This credit cannot be used in the Associate in Engineering, Associate in Science, or the Bachelor of Engineering Technology degree programs.

Further review; operations with polynomials, factoring, fractional expressions, word problems. *Prereq.* 10.671.

10.681 Introduction to Mathematics I (4 cl., 4 q.h.)

This credit cannot be used in the Associate in Engineering, Associate in Science, or the Bachelor of Engineering Technology degree programs.

A comprehensive review of high school algebra, including first-degree equations, factoring, fractions, fractional equations, ratio and proportion, word problems, and concepts of plane geometry.

10.682 Introduction to Mathematics II (4 cl., 4 q.h.)

This credit cannot be used in the Associate in Engineering, Associate in Science, or the Bachelor of Engineering Technology degree programs.

Algebraic operations with complex fractions, mixed expressions, square roots, radicals, quadratic equations; simultaneous equations, graphs and fractional zero and negative exponents; the geometry of the right triangle, areas of polygons, circles, and loci problems. *Prereq.* 10.681.

10.683 Applied Mathematics & Statistics (3 q.h.)

The use of mathematics as a guide to concise thinking; the application of mathematical methods to highlight significant data. The use of elementary analytical models to test and evaluate hypotheses. An examination of the role of chance in physical phenomena. The importance of the use of a relevant statistical model. Methods for the selection of a data base. *Prereq.* 10.682 or equiv.

PHYSICS

Courses marked not available in every curriculum. See curricula in Academic Programs of Instruction section for applicable sequence, pp. 65–94.*

11.417 Physics I (Mechanics) (4 cl., 4 q.h.) (Day Curriculum)

Kinematics and dynamics of particle motion; Newton's laws; projectile and circular motion; conservation laws for momentum and energy; rational motion; simple harmonic motion. *Prereq.* 10.407 or concurrently.

11.418 Physics II (Properties of Matter, Heat, Wave Motion, Sound, Light) (4 cl., 4 q.h.) (Day Curriculum)

Elasticity; density and pressure; temperature; expansion; heat; change of state; heat transfer; vibrating systems; wave motion; properties of sound; properties of light. *Prereq.* 11.417.

11.419 Physics III (Electricity, Magnetism) (4 cl., 4 q.h.) (Day Curriculum)

Electrostatics; circuit elements; direct current circuits; magnetism; electromechanical devices; alternating current circuits; electronics; electromagnetic waves. *Prereq.* 11.418.

11.473 Physics Laboratory I (2½ lab., 2 q.h.) (Day Curriculum)

Same laboratory as 11.373 not listed. It is scheduled during the day program. *Prereq.* 11.418.

11.474 Physics Laboratory II (2½ lab., 2 q.h.) (Day Curriculum)

Same laboratory as 11.374 not listed. It is scheduled during the day program. *Prereq.* 11.473.

***11.604 General Physics I (2 cl., 2 q.h.)**

Survey of Newtonian mechanics; kinematics, and dynamics of particle motion; projectile and circular motion; conservation laws of energy and momentum. *Prereq.* 10.627 or concurrently.

***11.605 General Physics II (2 cl., 2 q.h.)**

Temperature; heat energy; mechanical equivalent of heat; wave motion; sound; Doppler's effect; elasticity and simple harmonic motion; rotational motion; fluids at rest in motion. *Prereq.* 11.604.

***11.606 General Physics III** (2 cl., 2 q.h.)

Fundamentals of electricity and magnetism; fields; potential; electric current; inductance; capacitance; electromagnetism; a-c and d-c series circuits; properties of light; simple optical systems. *Prereq.* 11.605.

11.617 Physics I (Mechanics) (4 cl., 4 q.h.)

Vectors and balanced forces; accelerated motion; Newton's laws; projectile motion; work and energy; momentum; angular motion; centripetal force; rotation of rigid bodies; moment of inertia. *Prereq.* 10.407, 10.607, or concurrently.

11.618 Physics II (Properties of Matter, Heat, Wave Motion, Sound, Light)

(4 cl., 4 q.h.)

Elasticity; density and pressure; temperature; the gas laws; heat transfer; thermodynamics; vibratory motion; wave motion; properties of sound; properties of light.

Prereq. 11.417 or 11.617.

11.619 Physics III (Electricity, Magnetism) (4 cl., 4 q.h.)

Electrostatics; circuit elements; direct current circuits; magnetism; electromechanical devices; alternating current circuits; electronics; electromagnetic waves. *Prereq.* 11.418 or 11.618.

11.624 Introductory Survey of Lasers (2 cl., 2 q.h.)

Physical principles and technology will be emphasized. Includes a review of the fundamental concepts of light and spectroscopy, the basic theory of lasers, studies of solid state; atomic, ionic, and molecular gas; organic dye; and semiconductor lasers. Related optics and detection will be discussed. *Prereq.* 11.619.

11.673 Physics Laboratory I (2½ cl., 2 q.h.)

First quarter of a two-quarter physics laboratory. Experiments in mechanics, fluid dynamics, and gas laws. *Prereq.* 11.605, or 11.618, or concurrently.

11.674 Physics Laboratory II (2½ cl., 2 q.h.)

A continuation of 11.673. Experiments in wave motion, optics, and electrical circuits.

11.681 Introductory Physics I (4 cl., 4 q.h.)

This credit cannot be used in the Associate in Engineering, Associate in Science, or the Bachelor of Engineering Technology degree programs.

An introduction to mechanics: units of measurement, vectors, accelerated motion, and Newton's laws of motion. *Prereq.* none.

11.682 Introductory Physics II (4 cl., 4 q.h.)

This credit cannot be used in the Associate in Engineering, Associate in Science, or the Bachelor of Engineering Technology degree programs.

Continuation of mechanics: conservation of energy and momentum. Introduction to elements of heat, thermodynamics, light, and electromagnetism. *Prereq.* 11.681.

SUPPLEMENTAL COURSES

93.305 Survival Training (2 cl., 2 q.h.)

Training in and demonstration of modern techniques of human survival; methods in the wilderness environment.

93.306 Flight Safety Seminar (2 cl., 2 q.h.)

The case-study method will be used to increase the pilot's awareness of some of the most important factors affecting aviation safety. Official aircraft accident reports released by the National Transportation Board of significant aviation accidents will be used at the beginning of each case study. Elements to be included: aircraft reliability, air traffic control system, weather, regulations, and pilot skills.

93.401 Technical Communications (4 cl., 4 q.h.) (Aeronautical Program)

Thought organization and effective sentences; written reports and instruction manuals; specifications and proposals; graphic aids and reproduction processes. *Prereq.* 30.602.

93.402 Technical Communications I (2 cl., 2 q.h.)

Thought organization and effective sentences; written reports and instruction manuals. *Prereq.* 30.602.

93.403 Technical Communications II (2 cl., 2 q.h.)

Specifications and proposals; graphic aids and reproduction processes. *Prereq.* 93.402.

93.404 Technical Communications (3 q.h.)

Thought organization and effective sentences; written reports and instruction manuals; specifications and proposals; graphic aids, and reproduction processes. *Prereq.* 30.306, or 30.304 and 30.305.

93.502 Technical Mathematics (4 cl., 4 q.h.)

Fundamental algebraic operations; complex numbers; radicals and exponentials; logarithms; linear and quadratic equations; trigonometric functions of angles; identities; triangles and complex numbers in trigonometric form. Coverage adapted to the requirements of the program.

93.504 Electrical Circuits and Electronics I (4 cl., 4 q.h.)

Basic definitions; current, voltage, resistance, capacitance, inductance, power and energy sources; circuits, circuit laws and theorems. Diodes, bipolar and field-effect devices, biasing techniques. Introduction to a basic amplifier.

93.506 Electrical Instruments and Measurements (4 cl., 4 q.h.)

Combination of lectures, demonstrations, and experiments conducted in the laboratory. Introduction to the basic electronic instruments and electrical measurements. Demonstrations and experiments, based on and in parallel with the material presented in the lectures.

93.508 Electrical Circuits and Circuits Laboratory II (4 cl., 4 q.h.)

AC theory; impedance; introduction to frequency domain; spectrum and filters; Bode plots. *Prereq.* 93.502, 93.504, 93.506.

93.510 Electronics and Electronics Laboratory II (4 cl., 4 q.h.)

Small signal semiconductor device models and amplifier circuits. Cascading of stages. *Prereq.* 93.502, 93.504, 93.506.

Note: Laboratory work is based on the material covered in the lectures. Included are demonstrations by the instructor, as well as experiments performed by the student to reinforce the material presented in respective lectures. The laboratory work will follow the lecture on the same night.

93.512 Cable Communications and Cable Laboratory I (4 cl., 4 q.h.)

Lectures, demonstrations, and experiments to introduce the student to the principles of cable communication system: introduction to modulated signal-transmission systems, transmission line characteristics, cascaded amplifiers and repeaters. *Prereq.* 93.502, 93.504, 93.506.

93.514 Electronics II and Electronics Laboratory (4 cl., 4 q.h.)

Introduction to digital electronics and logic circuits; fundamentals of Boolean Algebra; gates, flip-flops, registers and counters, logic families. *Prereq.* 93.508, 93.510, 93.512.

93.516 Cable Communication II and Cable Laboratory II (4 cl., 4 q.h.)

Video and cable-system performance tests, and tests and measurements; modulation-demodulation tests; transmission line and repeater-amplifier tests, and distortion measurements; FCC proof of compliance/performance measurements. *Prereq.* 93.508, 93.510, 93.512.

93.518 Special Topics and Special Topics Laboratory (4 cl., 4 q.h.)

Satellite receiving and the head-end systems; cable-system design; and other related topics. *Prereq.* 93.508, 93.510, 93.512.

93.550 Concepts of Modern Technology I (3 q.h.)

A survey of the applications of physical science to mechanical devices. An introduction to the laws of thermodynamics. The influence of material properties on design and manufacturing techniques. *Prereq.* 10.382 or *equiv.*

93.551 Concepts of Modern Technology II (3 q.h.)

A survey of the applications of physical science to electrical and electronic devices. An introduction to electronic circuit design. A comparison of various devices used for amplification and control. A study of the development of the electronic digital computer and the components involved in the manufacture of computers. *Prereq.* 93.550.

93.552 Measurement and Analysis (3 q.h.)

A survey of instruments and techniques used to assure performance of electrical and mechanical components. An introduction to trouble-shooting and automated testing. A study of destructive and nondestructive tests and their relationship to each other. *Prereq.* 93.550 and 93.551.

93.553 Modern Electronics (3 q.h.)

A survey of components available to the designer of electronic devices, including linear integrated circuits and digital building blocks. Topics discussed will include: operational amplifier characteristics; truth tables and the synthesis of digital logic; logic families and specifications; counters, registers and decoding; digital instruments, digital to analog conversion. *Prereq.* 93.551.

93.554 Theory and Operation of Computers (3 q.h.)

An introduction to digital computer design and operation. Design topics include Boolean Algebra, synthesis of switching networks, and an introduction to general computer ar-

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chitecture and organization. Operational topics include input and output devices, systems development, programming tools, data communication, time sharing, data-base principle. *Prereq. 10.382 or equiv.*

93.604 Technical Communications (3 q.h.)

Thought organization and effective sentences; written reports and instruction manuals; specifications and proposals; graphic aids and reproduction processes. *Prereq. 30.306, or 30.304 and 30.305.*

93.606 Technical Communications I (3 q.h.)

Experiments with inexpensive and practical techniques to create competitive written and spoken presentations of a professional calibre. Topics include written and spoken presentations and audio-visual aids and presentations. *Prereq. 30.306 and 09.670.*

93.607 Technical Communications II (3 q.h.)

Experiments in the organizing, researching, and writing techniques essential to engineering management. The course leads students through an intensive examination and utilization of professional technical writing techniques. *Prereq. 93.606.*

93.610 Solar Water Heating (2 cl., 2 q.h.)

General types of solar water heaters; basic science and historical development of solar water-heating systems; design and installation of a typical system; cost benefits and savings; maintenance and payback.

93.611 Solar-Heating Design (2 cl., 2 q.h.)

Fundamentals of heat, heat transfer, insulation; sun angles, intensity and siting problems; system layouts; heat storage and heat exchangers; controls and sensing devices; design calculations and design practice. *Prereq. 93.610.*

93.650 The Technical Presentation (3 q.h.)

The application of technical communication to audiovisual presentations. Includes audience analysis, techniques of organization, script preparation, media selection, the design and production of visuals, the influence of physical factors on communication, and the elements of effective delivery. Participants will prepare and deliver technical presentations with video playback and peer critiques.

AERONAUTICAL TECHNOLOGY

Descriptions of flight training courses are included solely to provide guidelines for students in the flight portion of the Aeronautical Technology program.

96.308 Aircraft Power and Systems (4 cl., 4 q.h.)

Engine types, nomenclature, and engine development; engine cycles and principles, performance, power and its measurement, ratings; engine parts and their functions; valve mechanisms and timing; cooling system, carburation, fuel system, ignition system, lubrication, and oil system; batteries, propeller and engine breathing system.

96.324 Introductory Avionics (4 cl., 4 q.h.)

Basic coverage of electronics, including: vacuum tube principles, semiconductor physics principles, power supplies, amplifiers, oscillators, and pulse circuits; generator and motor

principles and applications; basic concepts of avionics, electrical hazards, aircraft electrical systems, electrical instruments, strobe lights, FCC regulations, radio communications, and antennas. *Prereq.* 11.619, 10.608.

96.325 Avionics (4 cl., 4 q.h.)

Reliability and maintainability of avionics, automatic direction finders, marker beacons, omnirange and localizers, audio switching systems. ATC transponders, glide slope systems, distance measuring equipment, autopilots, missile guidance, and new state-of-the-art avionics. *Prereq.* 96.324.

96.334 Private Flight Laboratory (8 lab., 4 q.h.)

Consists of the necessary flight training and instruction to satisfy the minimum Federal Aviation Administration requirements to apply for the flight test for the private pilot certificate, airplane rating, single engine. *Prereq.* Class I or II medical certificate.

96.335 Instructional Flight Laboratory (6 lab., 3 q.h.)

Consists of the necessary flight training and instruction to satisfy the minimum Federal Aviation Administration requirements to apply for the flight test for the instructor certificate, airplane rating, single engine. *Prereq.* 96.339.

96.336 Instrument Instructor Laboratory (4 lab., 2 q.h.)

Consists of necessary flight training and instruction to satisfy the minimum Federal Aviation Administration requirements to apply for the flight test for the instrument flight instructor rating, airplane, single engine. *Prereq.* 96.335.

96.338 Commercial Flight Laboratory (16 lab., 8 q.h.)

Consists of the necessary flight training and instruction to satisfy the minimum Federal Aviation Administration requirements to apply for the flight test for the commercial pilot certificate, airplane rating, single engine. *Prereq.* 96.334.

96.339 Instrument Flight Laboratory (8 lab., 4 q.h.)

Consists of the necessary flight training and instruction to satisfy the minimum Federal Aviation Administration requirements to apply for the flight test for the instrument rating, airplane. *Prereq.* 96.334 or 96.439.

96.340 Multi-Engine Flight Laboratory (2 lab., 1 q.h.)

Consists of the necessary flight training and instruction to satisfy the minimum Federal Aviation Administration requirements to apply for the flight test for the multi-engine rating, airplane. *Prereq.* 96.334.

96.358 Helicopter A (2 lab., 2 q.h.)

This course, in conjunction with part B, consists of the necessary flight training and instruction to satisfy the minimum Federal Aviation Administration requirements to apply for the flight test for the helicopter rating. *Prereq.* Commercial Fixed Wing License; Class I or II medical certificate.

96.359 Helicopter B (2 lab., 2 q.h.)

This course, in conjunction with part A, consists of the necessary flight training and instruction to satisfy the minimum Federal Aviation Administration requirements to apply for the flight test for the helicopter rating. *Prereq.* 96.358.

96.404 Fundamentals of Aeronautics (4 cl., 4 q.h.)

Aircraft structures and components; aerodynamic forces; airfoil terminology—lift and drag coefficient; boundary layer problems and control; earth in space latitude; longitude; properties and components of the atmosphere; map projections, dead reckoning; reciprocating engine theory; planform effects; aircraft weight and balance. Radio navigation; VOR, ADF, DME, and TACAN; airplane performance (climb, range, altitude, takeoff, and landing); aircraft propeller theory and operation; specific aircraft substructures (landing gear, etc.); advanced DR navigation problems (radius of action, unknown wind); physiology factors of flight; general review. Federal Aviation Regulations for Private Pilot.

96.405 Weather Station Operation and Observations I (4 cl., 4 q.h.)

Design, care, and operation of meteorological instruments, observing, coding, and recording data for aviation and synoptic reports. Map plotting, analysis, and use. Pseudoadiabatic diagram plotting and use. Routine duties of weather observer. Elementary forecasting theory. Trips to local weather stations, flight service stations, and weather radar installations. *Prereq.* 96.396.

96.406 Weather Station Operation and Observations II (4 cl., 4 q.h.)

A continuation of Weather Station Operation and Observations I. *Prereq.* 96.405.

96.407 Flight Engineering I (4 cl., 4 q.h.)

This is a preliminary course giving students the basic knowledge and exposure of the operating systems of large transport type aircraft. They will receive the basic systems knowledge of the Boeing 727. The major area of concentration will be aircraft general, pneumatic systems, hydraulic systems, fuel systems, electrical systems, pressurization systems, and engine operations. Upon successful completion of this course and recommendation from the instructor, students will be permitted to proceed with Flight Engineering II. *Prereq.* *Commercial License, Instrument Rating.*

96.408 Advanced Flight Mechanics (4 cl., 4 q.h.)

Aerodynamics, performance, stability and control, flight efficiency. *Prereq.* 96.437.

96.409 Practice of Flight Instruction (4 cl., 4 q.h.)

Fundamentals and principles of instructing; learning concepts of teacher procedures. Preparation for Federal Aviation Administration fundamentals of instruction written exam. Practice for basic, advanced, and instrument Federal Aviation Administration ground instructor exam. *Prereq.* *Permission of staff.*

96.410 Aviation History I (4 cl., 4 q.h.)

Detailed historical analysis from the dawn of aviation to World War II of efforts in manned flight, aircraft development, pioneers in flight, general aviation, military and commercial aspects of flight, and effects on modern civilization.

96.411 Aviation History II (4 cl., 4 q.h.)

A continuation of detailed historical analysis from the beginning of World War II through the space age. *Prereq.* 96.410.

96.412 Aviation Safety I (4 cl., 4 q.h.)

Commuter and multi-engine aircraft accidents. The course is divided into two sections. The first section deals with commuter airlines safety problems. A general view of com-

muter airline problems will be given. This will be followed by two case studies. The second section deals with the differences in two-engine operating requirements, according to the section of the Federal Aviation Regulations under which the aircraft is certified. Differences in safe operating procedures will be examined in detail. Commonly misunderstood terms of vital importance to safe multi-engine aircraft operation will be explained and illustrated.

96.413 Aviation Safety II (4 cl., 4 q.h.)

San Diego: A case study. A thorough examination of the various factors involved in the worst mid-air collision in American civil aviation history and its aftermath. Elements analyzed in detail include: FAA regulations and policies; air traffic control procedures; the actual tapes between air traffic controllers and pilots; pilot's cockpit conversations; eye-witness reports; National Transportation Safety Board's public hearing and subsequent report; Congressional hearings; news media coverage and resulting legal ramifications. An extensive multi-image slide presentation is used to aid the student's comprehension of time, critical events, and ultimate consequences. *Prereq.* 96.412.

96.414 Aviation Safety III (4 cl., 4 q.h.)

Significant aviation accidents/incidents: Case studies of aircraft accidents/incidents selected because of the vital issues of aviation safety involved. Drawing upon the student's knowledge acquired from the San Diego case study, the vital issues of a number of important aviation accidents will be studied. Each case study will focus only upon the most important elements, so that the study may gather a broad perspective of the safety issues involved. Case studies to be presented, among many, include the worst crash in American civil aviation and the collision at Tenerife—the worst disaster in aviation history. *Prereq.* 96.413.

96.415 Advanced Meteorology and Climatology (4 cl., 4 q.h.)

Physical approach to pressure, temperature, basic thermodynamics, stability, and cloud formations; elementary polar front theory; the general circulation of the atmosphere; climate causes and effects; climatology of several regions of the world; application of climatology to problems of airport location and construction, airline operation, and general aviation. *Prereq.* 96.444.

94.416 Flight Operations and Traffic System Seminars (4 cl., 4 q.h.)

Discusses complex topics pertaining to such areas as the air traffic system, aircraft operation, and weather. Content will generally be flexible to satisfy the participant's demand for solutions to problem areas. Experts in various fields will generally be employed as guest lecturers to enhance the course. *Prereq.* *Permission of staff.*

96.417 General Aviation Operations (4 cl., 4 q.h.)

A presentation of the major functions and problems of current airport management; organization, zoning, adequacy, financing, revenues and expenses, evaluation, and safety; the airport and its socioeconomic effect on the community. Study and analysis of airport functions, such as fixed-base operators, pilot training schools; airtaxi operations in both charter and schedule activities, corporate aviation. Master planning of airports is introduced in a general manner.

96.418 Intermodal Transportation (4 cl., 4 q.h.)

An overview of the major characteristics and current problems of each mode of transportation—air, rail, maritime, intercity, bus, motor carrier, and transit. Probes the inter-relationships among the major modes of transportation. *Prereq.* *none.*

96.419 Air Cargo (4 cl., 4 q.h.)

Study of commercial airline and air freight forward cargo practices, with emphasis on regulation, economics, marketing, handling, and organizational aspects.

96.420 Airline Traffic and Sales (4 cl., 4 q.h.)

Functions of the commercial airline traffic and sales department, relationship between the travel agencies and the airlines, relationships with other carriers, reservations and the procedures involved in the interline of the passenger to another carrier; airlines promotion. Tariffs and schedules, with an explanation of how flight times are established; flight summary frequencies; new routes; establishment of ticket fares, aspects of cargo and charters. *Prereq. none.*

96.421 Air Traffic Control System (4 cl., 4 q.h.)

Survey of the total aerospace system and management; air traffic administrative coordination; regional responsibilities; NAPEC organization of center, tower, and station. *Prereq. 96.437 or 96.438.*

96.422 Flight Physiology and Survival Techniques (4 cl., 4 q.h.)

The study of the physical and chemical processes of the body; functions of the living body and its environment; adaptive changes of function of the body resulting from a change in environment, with emphasis on flight; the effects of medication on the function and reactions of the body, with emphasis on flight; the effects of the state of the mind on the function and reactions of the body, with emphasis on flight. Training in and demonstration of modern techniques of human survival methods in the wilderness environment. *Prereq. none.*

96.423 Turbine Engines (4 cl., 4 q.h.)

A presentation of turbine engine types and their development; centrifugal flow and axial flow types, turbo-prop, turbo-shaft, turbo-jet, turbo-fan, ram jets, pulse jets, and rockets; principles of combustion and propulsion, performance, power, thrust, and their measurement; fuel, lubrication, and ignition systems. *Prereq. 96.308.*

96.430 Aviation Preventive Maintenance (2 cl., 2 q.h.)

For pilots and aircraft owners. Airframe and powerplant nomenclature, structures, and systems; maintenance that a pilot can and is allowed to do to the airframe and engine of his aircraft; proper techniques.

96.434 Aircraft Accident Investigation and the Aviation Professional—A (4 cl., 4 q.h.)

Purpose and legal source of aircraft accident investigation; the rights, obligations, and limitations of the National Transportation Safety Board (NTSB), Federal Aviation Administration (FAA), parties-to-the-investigation. *Prereq. Permission of staff.*

96.435 Aircraft Accident Investigation and the Aviation Professional—B (2 cl., 2 q.h.)

A condensed version of 96.434. *Prereq. Permission of staff.*

96.437 Advanced Aeronautics (4 cl., 4 q.h.)

Aircraft structural limitations, aerodynamics and forces, aircraft weight and balance, advanced airplane performance, stability and control, spins and commercial flight maneu-

vers, high performance aircraft, commercial pilot Federal Air Regulations, introduction to part 135 FAR's and introduction to flight engineering; preparation for airplane commercial written test. *Prereq.* 96.404.

96.438 Instrument Procedures (4 cl., 4 q.h.)

Aerodynamics, instrument flight charts; IFR planning; aviation weather; instrument flight rules; static and dynamic stability of aircraft; control movements and forces. Spins and spin recoveries; clearance notation; aircraft performance; instruments and scanning procedures; structural strength limitations; precision approach radar and airport surveillance radar; pressure pattern flight. Preparation for Federal Aviation Administration instrument written exam. *Prereq.* 96.404.

96.439 Advanced Flight Laboratory (4 q.h.)

Consists of the necessary flight training and instruction to satisfy the minimum Federal Aviation Administration requirements to apply for the flight test for the commercial pilot certificate, airplane rating, single engine. *Prereq.* 96.334.

96.440 Introduction to Aircraft Design (4 cl., 4 q.h.)

Basic orthographic principles and interpretations of aircraft design; a presentation of basic aerodynamics, structural characteristics of aircraft, materials, and manufacturing processes. *Prereq.* 10.307.

96.441 Introduction to Aerodynamics (4 cl., 4 q.h.)

A noncalculus presentation of basic fluid dynamics and principles of fluid flow includes continuity, Bernoulli, and momentum equations; streamlines, stream tubes, drag, theory of lift, wing theory, vortex flow, ground effect, stalls, boundary layer, flow separation, control surfaces, stability, and balance. *Prereq.* 10.608 and 11.618 or 10.408 and 11.418.

96.442 Basic Helicopter Aerodynamics (4 cl., 4 q.h.)

General aerodynamics; helicopter components and their functions; loads and load factors; gyroscope precession principle; performance; introduction to flight manual, helicopter operations in confined areas, precautionary measures and critical conditions. *Prereq.* 96.404.

96.443 Aircraft Systems (4 cl., 4 q.h.)

Hydraulic, pneumatic, electrical, and mechanical systems; landing gear types, design loads and limitations; landing gear retraction systems; general flight control systems, including rudder, elevator, aileron, and flaps; loads and limitations, deicer systems for flight surfaces, cabin pressurization and oxygen systems; electrical and air-driven instrument systems. Analysis of high performance business aircraft systems. *Prereq.* 96.437.

96.444 Meteorology and Climatology (4 cl., 4 q.h.)

A survey of the principles and structure of the atmosphere; pressure systems and fronts; tropical meteorology; meteorological instruments and observations; weather map interpretation and common aviation weather teletype codes. *Prereq.* 11.418.

96.445 Advanced Flight Mechanics (4 cl., 4 q.h.)

Aerodynamics, performance, stability and control, flight efficiency. *Prereq.* 96.437.

96.500 Tactical Air Field Refueling System (cl. special, 4 q.h.)

Classroom and practical training will be utilized to ensure student capability to both operate and maintain the tactical air field refueling system. Practical applications to make the student aware of 1) set-up; 2) terrain features; 3) operation of pumps and bladders for possible problems and actions to be taken; 4) fuel testing for contamination. Will be conducted utilizing the actual physical equipment.

the lincoln college faculty

The strength of an educational institution lies in the quality of its faculty. This is especially true in a college devoted to the training of mature men and women, many of whom are already employed in their chosen professions.

The instructional staff of Lincoln College is composed of professional academicians from Northeastern University and neighboring educational institutions, and practicing professionals from the scientific and industrial community of Greater Boston. The theoretical training and practical experience represented by this combination of specialists are ideally suited to the technology programs they teach and the adult students they serve.

The faculty are selected for their ability and active interest in the welfare of ambitious part-time students. They are men and women of culture and high ideals, and are qualified by educational training and professional experience to teach effectively in their respective fields.

A staff of experienced professional educators who serve as program and course consultants constitutes the Academic Advisory Council and Curriculum Advisory Committee of the College. They guide, supervise, and assist with the administration of courses and programs.

THE FACULTY

The following is an alphabetical list of the faculty of Lincoln College; degrees earned; professional affiliation; and Lincoln College department (year of appointment).

Arnold M. Aaron, B.S., M.S., Ph.D.
Engineer, Naval Underwater Systems Center
Electrical Engineering Technology (1974)

Velda Adams, M.S.
Member, Technical Staff, GTE Labs.
Computer Technology (1980)

*Arnold W. Almquist, Jr., B.S., M.Ed.
Mathematics Instructor, Needham High School
Mathematics (1967)

Peter Anderson, B.S., M.S.
Electrical Engineer, Stein Associates, Inc.
Electrical Engineering (1976)

*Robert B. Angus, Jr., B.S., M.S., P.E. (Mass.)
Principal and Consultant, Angus Associates
Electrical Engineering Technology (1947)

*Appointed to the rank of Senior Lecturer

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- Russell S. Arena, A.S., B.S.
ASSWT-Chief Pilot, E.W. Wiggins Airways, Digital Equipment Corp.
Aeronautical Technology (1980)
- *Robert J. Averill, B.S., M.S.
Executive Vice President, Sala Magnetics, Inc.
Course Consultant, Electrical Engineering Technology (1957)
- John S. Ballas, B.S., M.S., M.B.A.
Dir. of Eng., Brattle Instruments Corp.
Electrical Engineering Technology (1981)
- John C. Balsavich
Laboratory Supervisor, Electrical Engineering, Northeastern University
Electrical Engineering Technology (1957)
- Henry G. Barry, M.Ed.
Newton School System
Mathematics (1979)
- Adolph Baumann, B.S., P.E. (Mass.)
Telecommunications Eng., GTE Sylvania
Electrical Engineering Technology (1955)
- *Matteo P. Berardi, B.S., M.S.E.I.T. (Mass.)
Supervisor, Stone & Webster Eng. Corp.
Mechanical Engineering Technology (1960)
- Maureen P. Berggren, B.S.
Mathematics (1965)
- Ralph S. Blanchard, B.S.M.E., M.S.M.E., P.E. (Mass.)
Assistant Dean, College of Engineering, Northeastern University
Assoc. Program Consultant, Mechanical Engineering Technology (1950)
- Robert E. Bobeck
Professor, Bristol Community College
Engineering Graphics (1976)
- *Edward Bobroff, B.M.E.
Engineering Consultant, Medical Area Total Energy Plant
Program Consultant, Mathematics (1946)
- Alan Bradshaw, B.S., M.S., C.A.G.S. (Mass.)
Superintendent, Chelmsford School System
Mathematics (1966)
- *Eugene G. Branca, S.B., S.M.
Assistant Headmaster (Retired), Hyde Park High School
Course Consultant, Mathematics (1946)
- *Donald H. Breslow, S.B., M.S.
Director of Engineering, Measurement Systems Division, Itek Corp.
Electrical Engineering Technology (1959)
- *Donald C. Brock, B.S., M.S.
Mathematics Instructor, Needham High School
Mathematics (1965)
- *Franklyn K. Brown, B.S.Ed., M.Ed.
Associate Professor, Design Graphics, Northeastern University
Course Consultant, Engineering Graphics and Computation (1955)
- Jeffrey L. Bruce, B.S., M.A.
Software Engineer, Raytheon Missiles Division
Mathematics (1969)
- *Morris H. Burakoff, B.S., P.E. (Mass.)
Department Chief, Western Electric Company
Electrical Engineering Technology (1957)

*Appointed to the rank of Senior Lecturer

- *Leroy M. Cahoon, B.S.C.E., M.S., P.E. (Mass., Conn.)
Associate Professor of Civil Engineering, Northeastern University
Program Consultant, Civil Engineering Technology (1962)
- *Frank R. Cangiano, B.S., Ed.M.
Instructor in Science and Mathematics, Medford High School
Mathematics (1957)
- Edgar T. Canty, B.S., M.S.
Director, Academic Computing Services, Babson College
Mathematics (1966)
- Joseph M. Cardito, B.S., M.S., Ph.D., P.E. (Mass.), C.H.P. (Amer. Brd. Health Physics)
Supervisor, Nuclear Fuels and Data Systems, Stone & Webster Eng. Corp.
Mechanical Engineering Technology (1978)
- Alfred F. Carpenito, B.S., M.Ed., M.A.Ed.
Retired Assistant Headmaster, Boston Technical H.S.
Engineering Graphics (1965)
- Robert W. Case, Ph.D.
Coordinator for Day Program, Lincoln College
Mathematics (1976)
- *Walter J. Casey, A.B., M.Ed., M.A.T.
Dept. Chairman, Brighton High School
Mathematics (1955)
- Margret P. Casper, A.B., M.Ed.
King Philip Regional School District
Mathematics (1977)
- Joan M. Chrusciel, B.S., M.Ed., M.A.
Mathematics Teacher, Quincy High School
Mathematics (1980)
- Vincent L. Cocco, B.S.
Senior Engineer, Polaroid Corporation
Mechanical Engineering Technology (1978)
- Thomas C. Coleman, B.S.M.E., M.S.M.E., Ph.D., P.E. (Mass.)
Supervising Mech. Engineer, United Engineering and Construction
Course Consultant, Mechanical Engineering Technology (1960)
- Wendell R. Collymore
Drafting Supervisor, Polaroid Corporation
Engineering Graphics (1976)
- Leonard M. Conlin, A.B., Ed.M.
Mathematics Teacher, Framingham North High School
Mathematics (1967)
- *Roger T. Connor, A.B., M.Ed.
Teacher, Milton Academy
Course Consultant, Calculus (1953)
- *Robert J. Connors, B.S.
Manager of Technology, Electronic Systems, Sylvania Electric Products, Inc.
Electrical Engineering Technology (1948)
- *Joseph Z. Cooper, B.S.E.E.
Principal Engineer, Raytheon Company
Computer Technology (1967)
- *James B. Corscadden, B.S., M.Ed., A.M.T.
Assistant Headmaster, South Boston High School
Mathematics (1967)
- Edward F. Crosby, B.S.E.E., M.B.S., P.E. (Mass.)
Training Manager, New England Telephone
Engineering Economy (1980)

*Appointed to the rank of Senior Lecturer

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- David C. Crockett, B.S., M.S.
Senior Engineer, Raytheon Company
Mechanical Engineering Technology (1969)
- Steven S. Cushman, B.S.
Software Consultant
Computer Technology (1977)
- *Herbert R. Davenport, B.S.E.E.
Standards Engineer, GenRad Inc.
Electrical Engineering Technology (1948)
- *Warren C. Dean, A.B., M.A.
Professor of Mathematics, Northeastern University
Mathematics (1941)
- Charles A. DeAngelis, B.S., M.S., P.E. (Mass., Ind.)
Senior Structural Engineer, Stone & Webster Eng. Corp.
Civil Engineering Technology (1976)
- *John L. Dearnness, A.S.E.E., B.S.E.E. (Equiv.)
Branch Manager (Quality Assurance), Northrop Corporation
Aeronautical Technology (1972)
- Peter DeCenzo, B.S.
Mathematics Teacher, Ashland High School
Mathematics (1979)
- Richard Deveney, B.A., M.Ed.
Mathematics Instructor, Boston Public Schools
Mathematics (1978)
- Thomas R. Deveney, B.S., M.A.
Basic Skills Coordinator K-12, Boston Public Schools
Mathematics (1965)
- Jane E. DeVoe, B.S., M.A.
Director, Project SEED
Mathematics (1980)
- Douglas H. Diamond, B.E.E.
Program Manager, Analytical Systems Eng. Corp.
Mathematics (1968)
- *Giles C. Dilg, B.S.E.E., M.S.E.E., P.E. (Mass.)
Manager, Honeywell Info. Systems
Engineering Graphics (1966)
- Marie Dolansky, B.S., M.Ed., Ed.D.
Instructor, Mathematics, Northeastern University
Mathematics (1964)
- Mark Domaszewicz, B.E.E., M.S.E.E.
Senior Engineer, Raytheon Company
Electrical Engineering Technology (1970)
- Leonard F. Dow, B.S.E.E., M.S., P.E. (Mass.)
Staff Engineer, Boston Edison Company
Electrical Engineering Technology (1970)
- Philip W. Dunphy, B.Sc., M.Ed.
Associate Professor, Cooperative Education, Northeastern University
Academic Counselor (1967)
- *William V. Durante, B.S., M.Ed., M.A.
Assistant Headmaster of Mathematics, Boston Latin School
Course Consultant, Mathematics (1964)
- John A. Ebacher, B.S., M.S.
Mgr., Advanced Engine Systems Analysis, General Electric Co.
Mechanical Engineering Technology (1967)

*Appointed to the rank of Senior Lecturer

- Henry B. Eden, B.S.
President, Anco Boston, Inc.
Engineering Graphics (1957)
- David T. Ellis, B.S., M.S.
Engineering Manager, Digital Equipment Corp.
Electrical Engineering Technology (1978)
- Adolf J. Erikson, B.B.A., M.B.A., P.E. (Mass.)
President, A.E. Engineering Corporation
Engineering Graphics (1966)
- Thomas C. Fantasia, M.S.E.E., B.S.E.E.
Electrical Engineering, Boston Edison Company
Electrical Engineering Technology (1981)
- Edwin H. Farr, B.S., M.S., Ph.D.
U.S. Dept. of Transportation
Mathematics (1980)
- Richard Fields, B.S., M.S.
Meteorologist, Minuteman Weather Service
Aeronautical Technology (1980)
- *William D. Finan, A.B., M.A., D.Ed.
Reading Director, Needham Public Schools
Course Consultant, Mathematics (1946)
- *Louis A. Fiore, A.E., B.B.A.
Chief Draftsman, American Science and Engineering, Inc.
Engineering Graphics (1956)
- John M. Flaherty, B.S., M.S., Ph.D.
Advanced R&D Physicist, GTE Sylvania, Inc.
Electrical Engineering Technology (1976)
- James J. Flannery, B.S.E.E., M.S.E.E., P.E. (Mass.)
Engineering Computer Applications, Division Head Boston Edison
Power Systems (1980)
- Peter F. Gibbs, M.B.A.
Special Consultant
Aeronautical Technology
- *Peter D. Gianino, B.S., M.S.
Research Physicist, R.A.D.C., Hanscom A. F. Base
Course Consultant, Differential Equations (1980)
Mathematics (1965)
- Sheldon L. Glickler, B.S., M.S.
Program Manager, G.C.A. Corp.
Mechanical Engineering Technology (1969)
- *William B. Goggins, Jr., B.S., M.S.E.E., Ph.D.
Staff Member, M.I.T. Lincoln Labs.
Electrical Engineering Technology (1964)
- *David Goldberg, B.S., M.S.E.E., M.S.E.M.
Program Manager, GTE Sylvania
Course Consultant, Engineering Graphics (1969)
- Bernard F. Goldstein, B.S., M.S., Ph.D.
Senior Analyst, Dynamics Research Corporation
Electrical Engineering Technology (1974)
- Forest W. Grumney, B.A., M.B.A.
Corporate Vice President, Human Resources
Mathematics (1963)
- Alan Hadad, B.A., M.A., M.S.
Associate Professor, Wentworth Institute
Mathematics (1979)

*Appointed to the rank of Senior Lecturer

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- *Francis R. Hankard, S.B., M.A.
Assistant Chief of Lab., Mass. Dept. of Public Safety
Program Consultant, Physics (1946)
- *Joseph J. Hansen, A.B., M.B.A.
Director, Planning Analysis, and Assistant Director, Strategic Planning, Raytheon Company
Assoc. Program Consultant, Mathematics (1959)
- *George C. Harrison, B.S., M.S.
Senior Principal Electronic Engineer, Polaroid Corporation
Electrical Engineering Technology (1962)
- *Harold Harutunian, A.B., M.A.T., Ed.D.
Prof., Salem State College
Mathematics (1965)
- Lewis H. Holzman, B.S.C.E., S.M.C.E., P.E. (Mass.), R.L.S. (Mass.)
Consultant, Computer Department, Stone & Webster Eng. Corp.
Computer Technology (1966)
- C. Gregory Hood, B.S., M.A., Ph.D.
Newton Public Schools
Physics (1975)
- Udo Hoppenz, B.S., M.S.
Associate Professor of Physics, Wentworth Institute
Mathematics (1979)
- Charles E. Jacob, B.S.E.E., M.S.Ed., M.L.S.
Master, Boston Latin School
Physics (1967)
- *Arthur W. John, B.S.E.E., M.S., M.B.A.
Manager of Engineering Training and Administration, Data General Corp.
Physics (1968)
- Eugene F. Joyce
Technician, Electrical Engineering Dept., Northeastern University
Electrical Engineering Technology (1963)
- Rosaleen Johnson, B.S., M.A.
Victor Electronics
Mathematics (1981)
- *John Kaczorowski, Jr., B.S.E.E., M.S.E.E.
Dean of External Programs, Wentworth Institute
Assoc. Program Consultant, Electrical Engineering Technology (1970)
- *Leon Katler, Certificate P.E. (Mass., Me., N.Y., Pa., Va.)
Senior Structural Engineer, Stone & Webster Eng. Corp.
Civil Engineering Technology (1963)
- Phillip T. Karatzas, B.S., M.S.
Nuclear Technology Engineer, Stone & Webster Eng. Corp.
Physics (1978)
- *Louis Katona, B.C.E., M.C.E., P.E. (Mass., N.Y.)
Senior Hydraulic Engineer, Badger America, Inc.
Civil Engineering Technology (1959)
- Sidney W. Kaye, B.Sc., M.Ed.
Senior Engineer, Raytheon Company
Mathematics (1967)
- *George F. Kent, B.S., M.S., M.B.A., P.E. (Mass.)
Assistant Chief Engineer, Stone & Webster Eng. Corp.
Course Consultant, Materials (1962)
- Bernard J. Kiley, B.E., M.E., P.E. (N.H., Mass., Conn.)
Senior Structural Engineer, Stone & Webster Eng. Corp.
Mechanical Engineering Technology (1958)

**Appointed to the rank of Senior Lecturer*

- *John J. Klein, B.S., M.S.
Manager, Design Engineering, Radio Corporation of America
Electrical Engineering Technology (1950)
- Joseph C. LaCroix, B.A., M.Ed., C.A.G.S.
Chairman of Math. Dept., Dorchester High School
Mathematics (1974)
- *Robert S. Lang, B.S., Ed.M.
Associate Professor, Industrial Engineering and Information Systems, Northeastern University
Program Consultant, Engineering Graphics (1955)
- Carl Leone, Jr., A.B., M.S.
Coord. of Athletics and Transportation, Quincy Public Schools
Mathematics (1965)
- A. Richard LeSchack, A.B., A.M.
Applied Mathematician, The Analytical Sciences Corp.
Mathematics (1968)
- Alvin J. Lesieur, B.S., M.Ed.
Instructor, Braintree High School
Engineering Graphics (1965)
- Sandra M. Lictor, B.S.Ed., M.Ed.
Assoc. Software Engineer, Raytheon Company
Mathematics (1967)
- *Demetre P. Ligor, B.S.E.E., P.E. (Mass.)
President, Applied Measurements, Inc.
Course Consultant, Physics (1959)
- Warren J. Little, B.S., M.S.
Technical Staff, Charles Stark Draper Labs., Inc.
Physics (1966)
- George M. Livingstone, Jr., B.S.
Private Practice
Civil Engineering Technology (1975)
- *Andrew G. Lofgren, A.A., Ed.M., P.E. (Mass.)
Self-Employed; Consultant and Lecturer on ANSI-Y14.5
Mechanical Engineering Technology (1946)
- Bertram S. Long
Associate Prof. Mechanical Eng., Northeastern University
Assoc. Program Consultant, Mechanical Engineering Technology (1975)
- *Roger G. Long, A.E., B.B.A., P.E. (Mass.)
Senior Staff, Arthur D. Little
Electrical Engineering Technology (1952)
- *Kenneth A. Lucas, B.S., M.Ed., P.E. (Mass.), R.L.S. (Mass., Me., N.H.)
President, Mass. School of Survey, Inc.
Civil Engineering Technology (1950)
- John F. Lutkevich, A.E., B.B.A.
Engineer-in-Charge, GTE Sylvania
Engineering Graphics (1956)
- *Alan A. Mackey, B.S., M.A.
Associate Dean, University College, Northeastern University
Mathematics (1952)
- Anton Mavretic, B.S., M.S., Ph.D.
Associate Professor, Boston University
Assoc. Program Consultant, Electrical Engineering Technology (1969)
- *Edward McCarren, Jr., A.E.
Product Engineer, Analog Devices, Inc.
Electrical Engineering Technology (1951)
- *Appointed to the rank of Senior Lecturer

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- *Carl J. Mellea, S.B., M.S., P.E. (Mass., R.I., Maine, Vt., N.H.)
Project Engineer, Howard, Needles, Tammen & Bergendorff
Civil Engineering Technology (1960)
- Robert L. Meserve, B.S., M.S.
Assoc. Professor, Civil Engineering, Northeastern University
Civil Engineering Technology (1978)
- *Walter Messcher, B.M.E., M.S.
Project Manager, U.S. Department of Transportation
Program Consultant, Computer Technology (1966)
- Richard W. Miller, B.S., M.S., P.E. (Mass.)
Principal Research Engineer, The Foxboro Company
Mechanical Engineering Technology (1959)
- *Ernest E. Mills, B.S., M.S., P.E. (Mass.)
Program Coordinator of Mechanical Engineering Technology and
Associate Professor of Mechanical Engineering Technology
Lincoln College, Day and Evening Programs (1946)
- Louis A. Moore, A.E., B.E.T., B.S.C.E., R.L.S. (Mass.)
Deputy Engineer, Commonwealth of Mass., Land Court, Boston
Civil Engineering Technology (1972)
- Richard L. Morin, B.S., M.S.
Research Associate, Northeastern University
Electrical Engineering Technology (1980)
- *Louis J. Nardone, B.S., M.S., P.E. (Mass.)
Associate Professor, Electrical Engineering Tech., Northeastern Univ.
Program Coordinator for Electrical Engineering Technology
Lincoln College, Day and Evening Programs (1955)
- Robert L. Norton, A.S., B.S., M.S., P.E. (Mass.)
Associate Professor Mechanical Engineering, Worcester Polytechnical Inst.
Computer Technology (1967)
- *Ray O. Oglesby, B.S.Ed., M.S.Ed.
Teacher, Newton North High School
Mathematics (1967)
- Yesugey Oktay, B.S., M.S., P.E. (Mass., N.Y., Cal., Me.)
Division Head, Mechanical & Structural Engineering, Boston Edison Co.
Civil Engineering Technology (1970)
- Peter J. O'Neill, A.B., M.A.T.
Mathematics Instructor and Computer Science Instructor, Norwood High School
Mathematics (1977)
- Douglas J. Ordway, B.A., M.Ed.
Teacher, Boston Public Schools
Mathematics (1975)
- *Thomas J. Owens, A.B., M.Ed.
Instructor in Mathematics, Quincy High School
Mathematics (1952)
- John P. Page, A.B., M.Ed., A.M.
Teacher of Mathematics, Boston Latin School
Mathematics (1980)
- *William H. Parmenter, A.E., B.B.A.
Instructor, Newton North High School
Electrical Engineering Technology (1952)
- Francis A. Pepicelli, A.E., B.S.
Engineer, Northrop Corporation
Mechanical Engineering Technology (1976)

*Appointed to the rank of Senior Lecturer

- Peter J. Philiou, B.S., M.S., J.D.
Director, Curriculum Center, Wentworth Institute
Mathematics (1967)
- Walter J. Phinney, A.E., B.E.T., M.B.A.
Manager, Product Design, Raytheon Company
Mechanical Engineering Technology (1977)
- Dominic A. Piccione, B.S., M.S.P.E. (Mass., Va.)
Senior Engineer, Stone & Webster Eng. Corp.
Mechanical Engineering Technology (1966)
- *Norman C. Poirier, B.S., M.S., P.E. (Mass.)
Research Associate, Northeastern University
Electrical Engineering Technology (1966)
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Sr. Test Eng., Kollsman Inst., Merrimack, New Hampshire
Electrical Engineering Technology (1970)
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Director of Computer Science, Boston Latin School
Mathematics (1967)
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Technical Staff, The Mitre Corporation
Course Consultant, Electrical Engineering Technology (1960)
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Civil Engineering Technology (1972)
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Program Control Manager, Raytheon Company
Mechanical Engineering Technology (1956)
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Engineering Graphics (1980)
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Mathematics (1967)
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Physics (1967)
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Mathematics (1965)
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Mathematics (1970)

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Mathematics (1959)
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Civil Engineering Technology (1965)
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Computer Technology (1977)
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Physics (1967)
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Physics (1968)
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Associate Professor of Physical Science, Boston State College
Mathematics (1956)
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Chairman, Math. Dept., Ashland High School
Mathematics (1965)
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Marketing Manager, EG&G
Mechanical Engineering Technology (1968)
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Electrical Engineering Technology (1965)
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Physics (1968)
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Mathematics (1957)
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Associate Civil Engineer, Massachusetts Department of Public Works
Civil Engineering Technology (1949)
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Engineering Design Supervisor, Stone & Webster Eng. Corp.
Course Consultant, Mechanical Engineering Technology (1948)
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Physics (1973)
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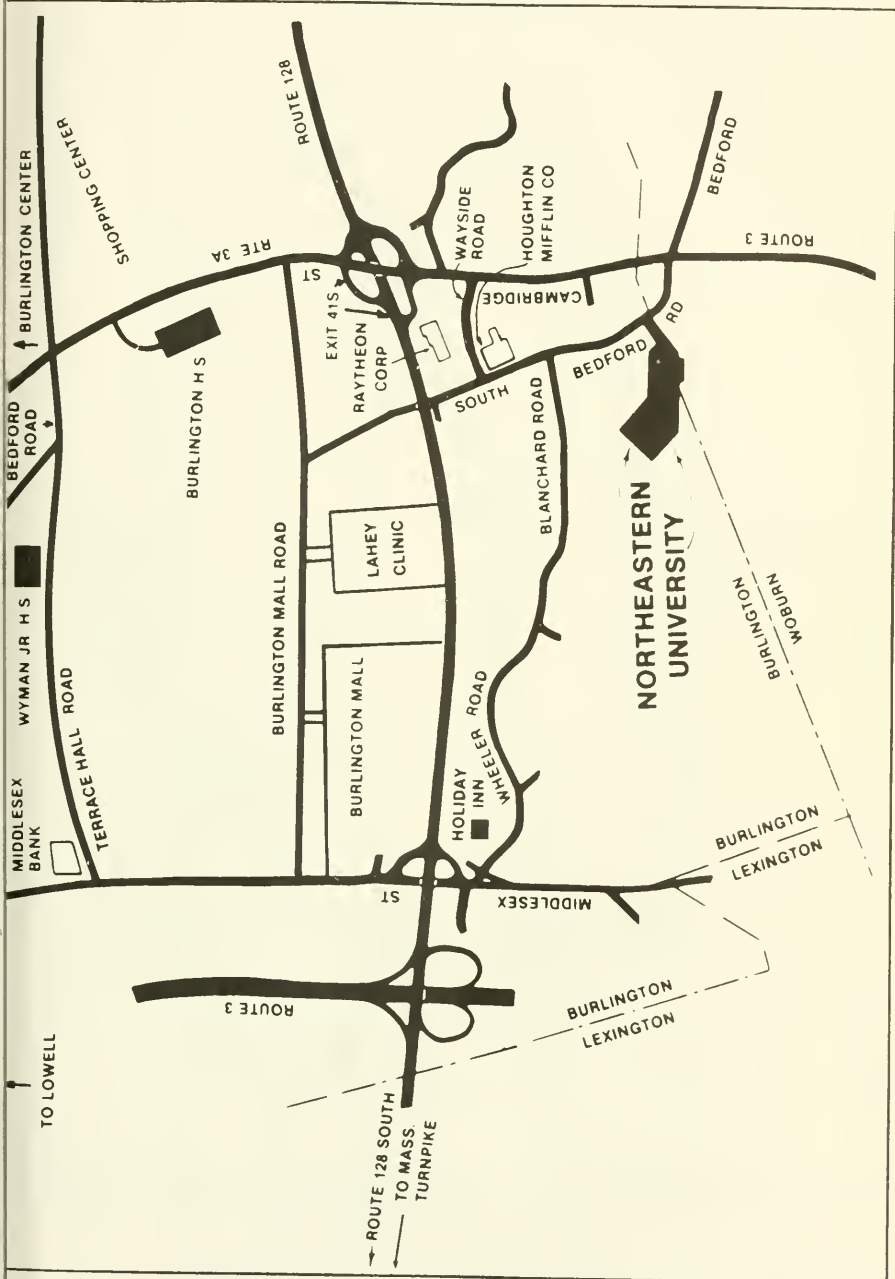
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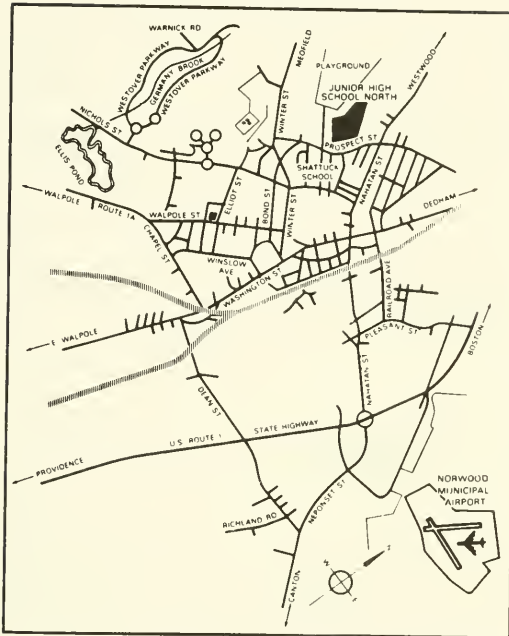
*Appointed by the President

Suburban Campus



This map illustrates the road network in Framingham, Massachusetts. The Mass Turnpike (Route 90) is the central north-south corridor. To the west, it connects to Route 126, which leads to Sudbury, Saxonville, and Wayland. To the east, it connects to Route 126, which leads to Holliston and Boston. Local streets shown include Concord St, School St, Water St, Central St, and Elm St. Landmarks such as Framingham North High School and Framingham Center are identified. The map also shows the Framingham Center and Framingham RR stations, and the location of Shopper's World. Arrows indicate directions to various destinations, including Worcester, Boston, and Holliston.

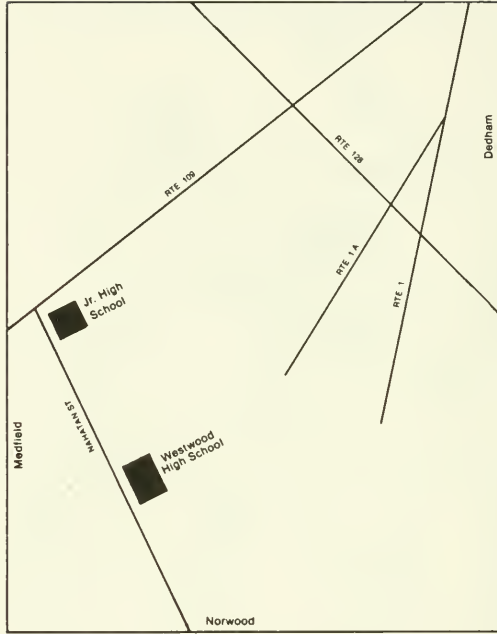
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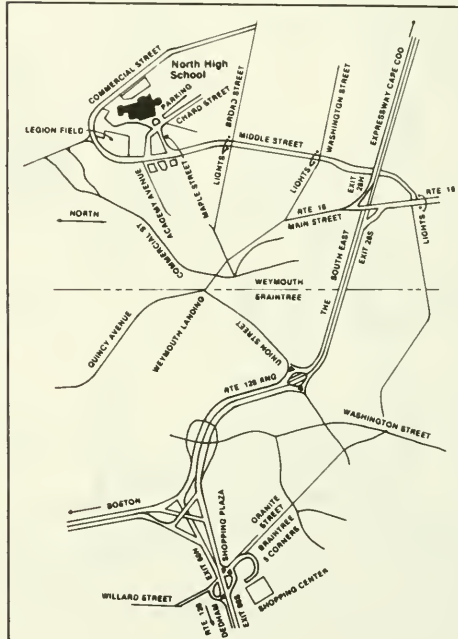
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Westwood High School



Weymouth Schools



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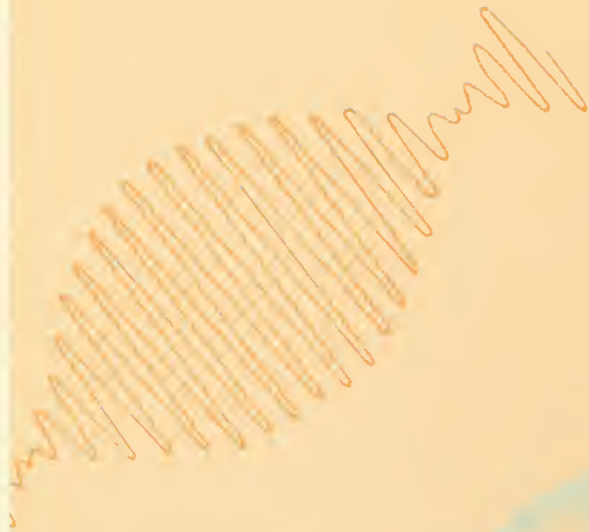
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The University

About Northeastern

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The state legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of about 180 distinguished business and professional men and women.

From its beginning, Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922); Liberal Arts (1935); Education (1953); Pharmacy (1962); Nursing (1964); Boston-Bouvé College of Human Development Professions (1964); the College of Criminal Justice (1967); and by Lincoln College's daytime Bachelor of Engineering Technology program (1971). This educational method enables students to gain valuable practical experience as an integral part of their college program and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, actuarial science, rehabilitation administration, professional accounting, business administration, and law.

In the field of adult education, programs of study have been developed through the Center for Continuing Education to meet a variety of needs, including seminars, conferences, institutes, forums, and special courses to serve specific student needs. University College offers evening courses—offered by the University since 1906—and adult day courses

leading to the bachelor's degree. In addition to offering day undergraduate programs in Electrical Engineering Technology and Mechanical Engineering Technology, Lincoln College offers evening/part-time certificate, associate, and bachelor degree programs in technological areas. All formal courses of study leading to degrees through part-time programs are approved by the Basic College faculties concerned.

Northeastern University is accredited by the New England Association of Schools and Colleges, Inc., which accredits schools and colleges in the six New England states. Accreditation by the Association indicates that the institution has been carefully evaluated and found to meet standards agreed upon by qualified educators.

Graduate and Professional Schools

The eight graduate and professional schools of the University offer numerous programs of study leading to the following degrees:

The Graduate School of Arts and Sciences offers the degrees of Master of Arts, Master of Science, Master of Science in Health Science, Master of Public Administration, and Doctor of Philosophy, as well as a Certificate of Advanced Graduate Study in Advanced Literary Study.

The Graduate School of Boston-Bouvé College of Human Development Professions offers the degrees of Master of Education, Master of Science, and Doctor of Education in addition to the Certificate of Advanced Graduate Study.

The Graduate School of Business Administration offers the degree of Master of Business Administration.

The Graduate School of Criminal Justice offers the degree of Master of Science.

The Graduate School of Engineering offers the degrees of Master of Science, Engineer degree, Doctor of Engineering, and Doctor of Philosophy.

The School of Law offers the degree of Juris Doctor.

The Graduate School of Pharmacy and Allied Health Professions offers the degrees of Master of Science, Doctor of Philosophy, and Doctor of Pharmacy.

The Graduate School of Professional Accounting offers the degree of Master of Science in Accounting.

Research

Northeastern University recognizes the importance of high-quality research as an essential ingredient of academic life. The University's maturing focus on research takes into account not only the intrinsic value of specific research projects, but also the importance of research as a vital and integral part of graduate education.

Responsibility for fostering and coordinating the development of research at Northeastern resides with the Vice Provost for Research and Graduate Studies, assisted by the University Council on Research and Scholarship. The Council serves as an advisory body for dealing with broad policy issues and procedures designed to encourage and facilitate research and scholarship. Administrative support for research projects and training programs is provided by the Office of Sponsored Programs, whose services include preparing and transmitting proposals and reports, monitoring contracts and grant funds, and assisting in locating sources of support. A recently introduced newsletter entitled *Re:Search* brings information about the research and scholarly efforts of Northeastern's faculty and students to the University community and the general public.

Faculty and graduate students receive funding for their research from a variety of sources, including government agencies, private industry, and foundations. The National Institutes of Health, the National Science Foundation, the National Endowment for the Humanities, IBM, Dow Chemical Corporation, and the Mellon Foundation are but a few of the organizations providing support. The University also contributes to many research projects through its own Research and Scholarship Development Fund, established to stimulate new ventures in research and scholarship and to provide seed money for the exploration of new ideas and approaches to problems that are likely to lead to high-quality publications and extramural support.

Northeastern University has numerous distinguished faculty members, many of whom have received prestigious awards, including Sloan Scholarships, Guggenheim Fellowships, and National Institutes of Health Research Awards. Faculty members lecture the world over. In addition, many faculty members serve as U.S. government consultants and participate on a variety of national and international committees.

Current research activities span almost every academic field and include laboratory projects, theoretical studies, and technological applications. Research is under way in the areas of business, physical and biological sciences, social sciences, humanities, allied health professions, and engineering. Student participation in these activities can take place as part of regular academic programs in the form of specially designed independent studies or through cooperative work assignments. Research involvement is actively encouraged and is limited only by the student's own motivation and curiosity.

The following summary of research represents just a small sample of the many projects now underway throughout the University.

In the *College of Arts and Sciences*, research projects reflect the diversity of its nineteen departments. Research in the humanities and in natural and social sciences includes studies in 19th century Boston architecture, the Off-Off Broadway theater, cable TV, quantum field theory, and infrared spectroscopy.

As part of the College's interdisciplinary interest in marine sciences, the Marine Science and Maritime Center has been established. At the Nahant field station and laboratory of this Center, faculty and graduate students perform studies in marine chemistry, biology, and botany.

The nature of research in *Boston-Bouvé College of Human Development Professions* is broad in range and diverse in approach. Changes in human development and the roles of the teacher and clinician in facilitating such changes are topics of lively interest. Some of the current research interests of the College include the communication abilities of normal and hearing-impaired individuals, the role of exercise in cardiovascular health and disease, the relationship between age change and the development of motor and cognitive skills in children, the evaluation of clinical practice in physical therapy and educational practices in the schools, and the examination of barriers to the employment of the disabled in leisure services.

Research in the *College of Business Administration* is divided between the theoretical and practical aspects of management, human resources, and marketing. New ideas in corporate practice and theory are conceived through investigations that include high technology, small-business entrepreneurship, and foreign investment in developing countries. Other studies cover U.S. transportation problems, federal regulatory agencies, and technology forecasting for emerging high technology firms.

The *College of Criminal Justice* is one of the few institutions in the United States in which crime and law are studied from interdisciplinary viewpoints. The focus of research in this college is on crime detection and prevention, industrial espionage, private security systems, and contemporary terrorism.

Research in the *College of Engineering* encompasses some of today's most important technological issues. Robotics, CAD/CAM, telecommunications, and space rocketry design are some of the areas under investigation. The College maintains close ties with industry, thereby augmenting its facilities and professional expertise. Other research activities deal with environmental, health, and transportation concerns.

The *School of Law's* research topics include a historical look at the Securities and Exchange Commission and studies of the new civil procedures. One project deals with the effects of the landmark *Tarasoff* court case on the mental health profession. National law school curriculum policies are also under investigation.

The *College of Nursing* is addressing some of the important problems currently facing the entire nursing profession. An answer to nursing burnout is sought in the School's new school nurse practitioner program. Assessments of this new direction in nursing as well as other employment

possibilities and problems are areas toward which the faculty are directing their research efforts.

Research studies in the *College of Pharmacy and Allied Health Professions* include topics such as new analytical methods for antidepressant and anticonvulsant drugs, the synthesis of new drugs, improving diagnostic techniques for cancer of the bladder, and clinical applications in respiratory therapy.

The *Cooperative Education Research Center* in the Department of Cooperative Education is concerned with the social and educational impact of the cooperative education mode. Through statistical surveys, data on cooperative education are compiled. Conclusions reached at this Center have important implications for future college costs, career opportunities, and educational priorities.

Northeastern also has several interdisciplinary centers and institutes currently involved in a variety of research projects spanning several disciplines. The following are among these centers:

The Institute of Chemical Analysis, Applications, and Forensic Science carries out basic research in analytical chemistry and material science. The Institute is also concerned with applications of these fields in industry, environmental regulatory agencies, and law and police departments. It has an international reputation in the fields of chromatography, mass spectrometry, amorphous metals, and solar energy storage devices.

The Center for Electron Microscopy provides advanced scientific equipment for the training of scientists and the performance of research into cellular and subcellular structures.

The Institute for the Interdisciplinary Study of Education serves as a center for the exchange of ideas on critical issues in education. The high technology industry, South African education, and community college programs for prisoners are topics of current research.

The Center for Applied Social Research is a nationally known center for studies dealing with current public and social policy issues. Projects are presently underway in the fields of criminal justice, public safety, mental health, social welfare, and education.

The Graduate School of Pharmacy and Allied Health Professions

Overview

The College of Pharmacy was established at Northeastern University in 1962. Shortly thereafter the Graduate School of Pharmaceutical Sciences was formed and offered full-time Master of Science degree programs in Hospital Pharmacy, Industrial Pharmacy, Medicinal Chemistry, and Pharmacology. All these programs involved one year of planned cooperative work experience.

In 1970, the College instituted a full-time doctoral program, leading to the Ph.D. in Medicinal Chemistry. This program was superseded in 1979 by a full-time doctoral program in Biomedical Science with specializations available in Medical Laboratory Science, Medicinal Chemistry, Pharmacology, Pharmaceutical Sciences, and Toxicology.

A program leading to the advanced degree of Doctor of Pharmacy (Pharm.D.), consisting of an intensive two-year, full-time curriculum of didactic course work and clinical experiences, became available in the 1980 academic year.

The necessity for making the Master of Science degree programs more relevant to the greater Boston community led to the establishment of part-time evening programs. In 1971, the Division of Allied Health Sciences joined with the College of Pharmacy to establish the new College of Pharmacy and Allied Health Professions. In 1972, two new part-time Master of Science degree programs were inaugurated, one in Medical Laboratory Science and one in Clinical Chemistry, the latter be-

ing cosponsored by the Chemistry Department in the Graduate School of Arts and Sciences. In 1974, a Master of Science degree program in Radiopharmaceutical Science was established.

Currently the College offers the following graduate programs:

Master of Science

Clinical Chemistry
Hospital Pharmacy
Medical Laboratory Science
Medicinal Chemistry
Pharmacology
Radiopharmaceutical Science

Doctor of Pharmacy (Pharm.D.)

Doctor of Philosophy in Biomedical Science

with specialization in:

Medical Laboratory Science
Medicinal Chemistry
Pharmaceutical Sciences
Pharmacology
Toxicology

Interdisciplinary Doctor of Philosophy

with specialization in:

Forensic Chemistry

General Regulations

The general regulations that follow are minimal requirements shared by the several degree programs. The student is advised to consult the appropriate program for a statement of specific requirements.

■ Application

Applicants should address their inquiries to the Director of the Graduate School of Pharmacy and Allied Health Professions. Application forms and other pertinent information will then be mailed to them. Submission of the completed forms, together with all official transcripts and two letters of recommendation, is essential before potential students can be considered for admission to a specific degree program. Applicants whose native language is not English must take the Test of English as a Foreign Language and submit the results to the Director of the Graduate School of Pharmacy and Allied Health Professions. A minimum score of 500 is required. All necessary supporting documents must be on file at least four weeks before the date of registration for the quarter in which the student expects to begin a scholastic program. Consideration of applications received after this date may be delayed.

Applicants to the doctoral program who desire assistantships should apply no later than March 15. It may not be possible to give equal consideration to applications received after this date. Candidates for financial awards should so indicate in their letter of application. These awards are usually restricted to full-time doctoral students. Such applicants are strongly urged to take both the aptitude and advanced portions of the Graduate Record Examination (see Doctoral Entrance Examination).

■ Admission

To be enrolled for graduate work, an applicant must submit a complete official transcript indicating the award of a baccalaureate degree from a recognized institution. Applicants must also provide evidence of their ability to pursue creditably a program of graduate study in their chosen field. Scholastic records must therefore show academic distinction, and undergraduate programs must show breadth as well as adequate preparation in the anticipated specialization. Acceptance to the school is granted upon recommendation of the Graduate Committee of Pharmacy and Allied Health Professions after a review of the completed application.

Foreign students who do not receive a graduate award or whose award is insufficient to cover all educational and living expenses must certify that they are able to meet all such expenses while at Northeastern. A visa may not be granted without such certification. Foreign students should note that many of the master's degree programs are part time and, therefore, students are not eligible for I-20 visas.

■ Student Classifications

Regular Students—Students accepted to a specific degree program.

Conditional Students—Students who have been accepted in the graduate school, but who are not formally matriculated in a degree program. Students in this category who wish to be admitted to a degree program must petition the Graduate Committee requesting a change in status. This request is to be made after the completion of twelve quarter hours of graduate credit. No more than sixteen quarter hours may be transferred from the conditional student category to a degree program. In those instances where additional courses have been taken, only the first sixteen quarter hours of credit are accepted. Conditional students are expected to obtain a B (3.0) average. All courses within this sixteen quarter-hour limitation, including those graded C, F, and I, are transferred if the student is admitted to a degree program. It is the student's responsibility to request, in writing, a change of status.

Special Students—Students who are permitted to take a single course by obtaining permission from the course instructor as well as administrative approval from the Director of the Graduate School. This approval does not commit the Graduate School in any way regarding future

admission of such a student as either a conditional or regular student.

Doctoral Students—Students admitted to a doctoral program.

Doctoral Degree Candidates—Doctoral students who have passed the qualifying examination.

■ Registration

After acceptance of admission, students should arrange an appointment with the Graduate Director for assignment to a temporary graduate adviser to discuss their academic programs well in advance of registration for the first semester. Students must register within the dates and times listed on the school calendar. The place of registration is announced before each quarter.

■ Residence

All course work for advanced degrees must be registered for and completed at Northeastern University unless the Graduate Committee has granted approval of work undertaken elsewhere.

■ Programs of Study

The study load for full-time students is eight quarter hours of course work or fewer hours of course work combined with an independent research project. Students involved in such a project should work closely with their advisers to determine their individual course load assignments. Part-time students should decide upon their course load after consulting with the director of their specific program. Courses in most fields are generally offered in the late afternoon and evening. Exceptions to this practice are posted with the quarterly list of course offerings.

■ Grading System

Performance of students in graduate courses is graded according to the following numerical equivalents:

A (4.0) This grade is given to those students whose performance in the course has been of very high graduate caliber.

A – (3.667)

B + (3.333)

B (3.0) This grade is given to those students whose performance in the course has been satisfactory.

B – (2.667)

C + (2.333)

C (2.0) This grade is given to those students whose performance in the course is not at the level expected in graduate work.

C – (1.667)

F (0) This grade is given to those students whose performance in the course is unacceptable.

Individual faculty members may choose not to use the plus and minus designations. If they elect to use the whole letters only, they must announce this to the class at the beginning of the quarter.

In addition, the following letter designations are used:

I Incomplete without quality designation.

This grade may be given to those students who fail to complete the work of the course.

L Audit without credit.

S Satisfactory without quality designation.

U Unsatisfactory without quality designation.

An S or U grade is used for the first quarter of a two-quarter sequence in which the grade for the second quarter applies to both the first- and second-quarter sequences.

All graduate research courses are graded on a pass/fail basis.

The I grade is changed to a letter grade when the deficiency that led to it is made up to the satisfaction of, and in the manner prescribed by, the course instructor, or, in his or her absence, by the chairman of the department issuing the grade. The period for clearing such a grade is restricted to one calendar year from the date of its first recording on the student's permanent record.

Students must indicate their preference for auditing a course at registration. No credit is given for the course; however, the course is included on the student's transcript. Registration changes from an audit to a graded status, or vice versa, must be made before the second week of classes. The tuition fee for an audit course is the same as that for a graded course.

■ Class Hours and Credits

All courses are entered as quarter-hour credits. A quarter hour of credit is equivalent to three fourths of a semester-hour credit.

■ Continuity of Program

Students are expected to maintain continuous progress toward a degree. Any student who does not attend Northeastern for a period of one year must apply for readmission.

■ Withdrawals

To withdraw from a course, students must complete an official withdrawal form, obtainable at the Registrar's Office or at the Suburban Campus Office. Withdrawals may be made through the ninth week of the quarter. Students are withdrawn only when the official form is filed with the Registrar. Ceasing to attend class or notifying the instructor does not constitute official withdrawal.

■ Changes in Requirements

The continuing development of the Graduate School may force frequent revision of curricula. In every new bulletin, some improvements are indicated. When no hardship is imposed on the student because of changes, and when the facilities of the school permit, the student is expected to

meet the requirements of the current bulletin. Any deviation from this procedure must be requested by petition to the Graduate Committee.

■ Application for the Diploma

Students must file commencement cards with the Registrar's Office on or before the applicable date listed in the calendar. For students failing to file, there is no assurance that the degree will be granted in that particular year, even though all other requirements have been fulfilled.

The Master of Science Degree

The information that follows pertains specifically to students enrolled or interested in Master of Science degree programs offered by the College of Pharmacy and Allied Health Professions.

■ Admission

Specific requirements for each degree program are found in the appropriate paragraphs for each program, beginning on page 22.

■ Academic Requirements

A candidate for the Master of Science degree must complete a minimum of forty quarter hours of correlated work of graduate caliber and other studies as may be required by the specific program.

To qualify for the degree, the candidate must obtain a final average of 3.0. This average is calculated quarterly by the graduate school on the basis of numerical equivalents described under **Grading System** and excludes any transfer credits from outside Northeastern University. All required courses will be accepted on a graded basis.

Not more than four quarter hours (generally two courses) of repeated courses, additional courses, or permanent I's may be allowed in order to satisfy the degree requirements.

Within the above limitations, students who receive an F in a required course must repeat the course and receive at least a C. Students may repeat a failed course only once. Students who receive an F in an elective course may either substitute another elective course or repeat the course to receive a better grade. If a grade of C is received in a required course, that course may be repeated once to obtain a grade of B or better.

■ Receipt of Second Master's Degree

Students who have completed an M.S. degree in the Graduate School of Pharmacy and Allied Health Professions and wish to obtain a second master's degree should petition to do so. Students must complete all the requirements listed for the second program, taking a minimum of sixteen additional quarter hours of graduate credit.

■ Transfer Credit

Up to twelve quarter hours of credit obtained at another institution may be accepted toward the master's degree, provided that the credits transferred consist of A or B grades in graduate-level courses, are in the candidate's field, have been earned at a recognized institution, and have not been applied toward any other degree. Students should petition the Graduate Committee, in writing, for all transfer credit. Transfer credit grades may not be used to obtain the academic average necessary for completion of degree requirements.

Students changing majors within the College or University receive transfer credit for all appropriate courses taken in the desired new major.

■ Time Limitation

Course credits earned in the program of graduate study or accepted by transfer are valid for up to seven years unless the Committee of the Graduate School of Pharmacy and Allied Health Professions grants an extension.

The Doctor of Philosophy Degree

The Doctor of Philosophy degree is awarded to candidates who show evidence of high attainment and research ability in their major field. The degree requirements outlined below are administered by the Graduate Committee. The Director of the Graduate School is responsible for certifying to the Graduate Committee that each candidate has completed all requirements.

■ Admission

After the admissions and academic standing committees of each program approve candidates, the Graduate Committee selects graduate students according to the following criteria: breadth of undergraduate training, excellence of academic record, and Medical College Aptitude Test and/or Graduate Record Examination scores (including both the aptitude test and the advanced test in biology or chemistry). Admission is limited by the number of graduate students already enrolled. The College is committed to the concept that individualized study fosters creativity in students and can be preserved only if a very low student-to-faculty ratio is maintained.

Students desiring admission to the doctoral program should have an undergraduate preparation that includes the following areas: mathematics, including calculus; one or two years of biology; one year of physics; and organic chemistry. (Some physical chemistry is highly desirable.) Students may enter this program from a variety of

backgrounds and orientations, ranging from undergraduate study of pharmacy or medical laboratory science to undergraduate study of biology or chemistry.

Applicants for admission to the doctoral program may apply to the Graduate Committee of the College of Pharmacy and Allied Health Professions after having completed a baccalaureate or M.S. degree program at an accredited institution in the pharmaceutical, biological, or physical sciences with a grade point average of 3.0 or better. Applicants must submit transcripts of their undergraduate and graduate work to date and three letters of recommendation to the Director of the Graduate School.

■ Residence Requirements

Candidates for the Doctor of Philosophy degree must spend the equivalent of at least one academic year in residence at the University as full-time graduate students. The Graduate Committee specifies the method of satisfying the residence requirement.

■ Doctoral Entrance Examination

Entrance requirements determined by the Graduate Committee usually include an entrance examination. All doctoral applicants have the option of taking one of the following:

- a. The ACS Graduate Level Placement Examination
- b. The Graduate Record Examination
 - i. General
 - ii. Advanced in chemistry, biology, or physics
- c. Medical College Aptitude Test (MCAT)

A student must select either (a), (b), or (c) prior to admission to the Ph.D. program. Those students planning to specialize in Medicinal Chemistry are urged to take option (a). Scores on these examinations form a basis for recommendations by the Director of the Graduate School, the Graduate Committee, or an adviser concerning the first-year graduate courses designed to make up any deficiencies in the student's background.

At its discretion, the Graduate Committee may drop a student from the doctoral program if the results of the doctoral entrance examination reveal deficiencies too great to be removed within one year.

■ Qualifying Examination

A qualifying examination is prepared by members of the graduate faculty and administered twice each academic year. Students are expected to take this examination within two years of the date of the doctoral entrance examination. The purpose of the qualifying examination is to test students' knowledge and skills in both required courses and specific scientific areas.

This examination is composed of three parts: (1) a written examination, (2) a general oral examination to be given approximately two weeks after completion of part 1, and (3) an oral exam involving presentation and defense of a specific research proposal different from the student's

thesis project. The oral exam is administered within three months of completion of part 2.

The written qualifying examination is composed of two parts, a general exam and a specialized exam, scheduled on two successive mornings. The first session is devoted to general, and the second to specialty, questions. Each part constitutes 50 percent of the grade. If either part is failed, the student must repeat the entire exam.

For the general exam, reflecting the required courses, students can expect one question each on biostatistics, pathophysiology, functions of human systems, and drug metabolism; two each on biochemistry, organic chemistry, and pharmacology. Students answer five of these questions, choosing no more than one question from each category.

The oral examining committees consist of the dissertation adviser, two other members of the College faculty, and one member of the University from outside the College, selected by the program director. Students must pass the written portion in order to take the oral examinations at the scheduled time. Students who fail the written part of the examination are given one additional opportunity to pass.

Students who pass the retesting are designated as doctoral degree candidates. Students failing any part of the written or oral examination twice are dropped from the program.

■ Course Requirements

The minimum course requirement of forty quarter hours of credit constitutes the work normally required for the master's degree. The course requirements beyond this total for the Ph.D. degree will depend upon the needs and interests of the individual.

■ Transfer Credit

If transfer credit for doctoral work is desired, approval of such credit must be given by the Director of the Graduate School of Pharmacy and Allied Health Professions. A maximum of twelve quarter hours of graduate credit obtained at a recognized institution is accepted, provided that the credits transferred are in the candidate's field, consist of work performed at a graduate level for graduate credit, and carry grades of A or B. Students should petition the Director of the Graduate School of Pharmacy and Allied Health Professions in writing for all transfer credit.

■ Dissertation

Each doctoral student must complete a dissertation that embodies the results of extended research and makes an original contribution to the field. This work should give evidence of the candidate's ability to conduct independent investigation and to interpret the results of his or her research in an acceptable manner.

A thesis adviser should normally be selected within four months of completing the entrance examination. The selection of an adviser is by mutual consent of the student and a member of the faculty, with approval of the Director of the Graduate School. The student normally is

expected to begin research and demonstrate satisfactory proficiency in the laboratory before taking the qualifying examination.

The thesis adviser serves as Chairman of the Thesis Committee, consisting of no fewer than three members appointed by the Director of the Graduate School. At least two members of the committee must be faculty members of the University. At least one member is to be selected from outside the department. To ensure the high quality of the thesis, the Director of the Graduate School may appoint additional outside readers or referees. Individuals are chosen for their expertise in the student's area of research. The student's research progress is evaluated by this Committee, meeting no less than twice a year, at which meetings the student presents both a written and an oral progress report. Low productivity or unsatisfactory work may result in the student's dismissal from the program at any time.

Thesis guidelines are available in the graduate office.

■ Foreign Language

A reading knowledge of one foreign language, such as French, German, or Russian, is required. The Thesis Committee prescribes the manner in which proficiency in the language is determined. With the approval of the Graduate Program Director and the Thesis Committee, an appropriate course in computer science or advanced statistics may be substituted for the foreign language requirement.

■ Research Proposal Defense

After completion of the qualifying examination, and before the final oral examination, students, with the approval of the Thesis Committee, prepare a written proposal and defend it orally before the Committee (see "Qualifying Examination").

■ Final Oral Examination

The final oral examination is taken after the completion of all other requirements for the degree. The Thesis Committee, consisting of at least five members, conducts the final oral examination. The Director of the Graduate School of Pharmacy and Allied Health Professions, together with the program director, appoints any additional members considered necessary to this Committee.

The final oral examination deals with the subject matter of the doctoral dissertation, significant developments in the field of the dissertation, and the student's background knowledge in his or her field of specialization.

■ Time Limitation

After the establishment of degree candidacy, a minimum of two years and a maximum of five years is allowed for completion of the degree requirements.

■ Registration

All students must register in the Registrar's Office for course work or dissertation as approved by the faculty adviser. Students must be registered for the dissertation and for the Biomedical Science Colloquium each quarter, up to and including the quarter in which they take the final oral examination.

Interdisciplinary Programs

Some graduate students may wish to pursue doctoral programs that involve substantial work in two or more graduate departments or colleges within the University. To meet this need, an interdisciplinary program may be established that corresponds in scope and depth to doctoral standards, but does not agree exactly with the individual graduate school regulations.

■ Admission

Application for admission to interdisciplinary doctoral study consists of the submission of a carefully thought-out, written proposal describing the areas of projected study and research. The proposal may be a part of the initial application for admission to graduate study at Northeastern University, or it may be submitted by a student already enrolled. It may be directed to a doctoral degree-granting department or to the Director of the Graduate School, who then forwards it to the appropriate department. In either case, admission to interdisciplinary doctoral study requires favorable recommendation by the sponsoring doctoral degree-granting department and approval by the Graduate Committee of the Graduate School of Pharmacy and Allied Health Professions.

■ Formation of Interdisciplinary Committee

Students who have been accepted for interdisciplinary study must obtain the consent of an adviser who directs their doctoral dissertation. This adviser, who may or may not be a member of the sponsoring department, serves as Chairman of the Interdisciplinary Committee for a specific student. A second member is appointed from the sponsoring department by the director of the doctoral program. These two members select one or more additional members. At least two departments must be represented on the committee, and most of the committee members must come from doctoral degree-granting departments. The chairman of the sponsoring department notifies, as soon as possible, the Director of the Graduate School of Pharmacy and Allied Health Professions regarding the committee membership.

■ Duties of Interdisciplinary Committee

A member of the Interdisciplinary Committee, who is also a member of the sponsoring department, serves as the registration officer to approve the student's course registration. A copy of the approved course registration must also be filed with the other committee members and with the Graduate Committee.

The Interdisciplinary Committee is responsible for approval of the dissertation and for administration of the qualifying examination, language examination, and comprehensive examination. This Committee must also certify to the sponsoring department the completion of the requirements for the doctoral degree.

The Interdisciplinary Committee must be assured that the student's program represents standards comparable to those of the sponsoring department and that the program is not so broad that it has inadequate depth in any area. The Director of the Graduate School may review the program at any time to determine whether its objectives are being met.

Fields of Study

The sections that follow list degree programs and courses available to students during the typical period of attendance required to obtain each degree. The place and time for which a specific course is offered may be found in the course announcement pamphlet made available in May for the summer quarter and in June for the following academic year.

Part-Time Master of Science Degree Program in Clinical Chemistry

■ Objectives

There is an increasing need for individuals with advanced training in the chemical and biological sciences to work in the clinical laboratory.

Northeastern offers a part-time, evening Master of Science degree program in Clinical Chemistry under the joint sponsorship of the Department of Chemistry and the Graduate School of Pharmacy and Allied Health Professions. The program is available to people currently practicing clinical chemistry or those with appropriate backgrounds who wish to train for this field.

The development of this program came about through careful deliberation by members of the Departments of Chemistry, Medicinal Chemistry, and Medical Laboratory Science. It is a truly interdisciplinary offering, representing a composite of the skills and knowledge of each of these disciplines. It is one of a series of graduate programs designed to help meet the frequently expressed needs of clinical personnel.

■ Admission and Program Features

The Clinical Chemistry Academic Standing Committee also serves as the Admissions Committee for this program and is composed of three faculty members: one from the Department of Medicinal Chemistry and two from Medical Laboratory Science. The Committee evaluates the back-

ground of applicants, suggests course sequences, and informs students of offerings that can help them maximize their background in clinical chemistry.

For admission to this part-time M.S. degree program, the applicant must have completed a baccalaureate program in biology, chemistry, medical technology, pharmacy, or a related field. Undergraduate requirements are: a minimum of one year of organic chemistry, one year of analytical chemistry, each with a laboratory or its equivalent, one year of human physiology, and one year of physical chemistry. An individual who has deficiencies in any of these areas may take appropriate courses at Northeastern University concurrently with graduate courses that do not require the deficient prerequisites. The appropriate evening courses offered at University College of Northeastern University are: Analytical Chemistry, 12.421-12.423 or 12.427; Organic Chemistry, 12.431-12.433; Physical Chemistry, 12.441-12.443; and Human Anatomy and Physiology, 18.424-18.426. Equivalent courses are accepted from this University or other accredited universities. Students admitted with deficiencies must remove them during the first twelve quarter hours of graduate work. By the completion of the degree requirements, students must have at least one year of acceptable clinical laboratory experience subsequent to attaining the appropriate baccalaureate degree.

Students in good standing in the program who lack this experience requirement may apply for the course 87.165, Clinical Chemistry Applied Study (carries five q.h. of undergraduate credit, two q.h. of which may be applied toward the master's degree). Students should consult the Medical Laboratory Science Clinical Coordinator regarding prerequisite courses and the details for taking this course, which must be arranged at least six months before course enrollment. This course is offered through the Graduate School of Pharmacy and Allied Health Professions of Northeastern University at one of the nearby affiliated hospitals and provides three months of this experience requirement. Individuals who have completed this course may have the opportunity to obtain subsequent employment in this field and thereby satisfy the one-year experience requirement.

The program is available on a part-time basis, with courses offered primarily during the evening hours. Courses are scheduled in the fall, winter, spring, and summer quarters. Students are generally expected to complete the degree requirements in a minimum of three years; however, the duration may sometimes be increased or decreased to satisfy the particular needs and requirements of the student. No research report or thesis is required.

■ Curriculum

The candidate must complete a minimum of forty quarter hours of graduate work.

<i>Required Courses</i>	<i>Credits</i>
10.8H3 Biostatistics	2
12.810 Modern Methods of Analysis	3
12.821 Analytical Separations	2
72.834 Advanced Clinical Chemistry I	2
72.835 Advanced Clinical Chemistry II	2
72.837 Seminar and Report in Clinical Chemistry I	2
72.845 Radioisotopes in Biological Systems	2
87.810 Functions of the Human Systems	2
90.821 Biochemistry I	2
90.822 Biochemistry II	2
90.823 Biochemistry III	2
Quarter Hours	23

<i>Elective Core</i>	<i>Credits</i>
A minimum of twelve credits must be taken from the following list:	
12.822 Electroanalytical Chemistry I	2
12.824 Special Topics in Analytical Chemistry I	2
12.825 Special Topics in Analytical Chemistry II	2
12.829 Computers in Chemistry	3
18.841 Human Genetics	2
72.825 Special Topics in Clinical Chemistry	2
72.838 Seminar and Report in Clinical Chemistry II	2
72.839 Seminar and Report in Clinical Chemistry III	2
72.861 Advanced Medicinal Chemistry I (CNS Depressants)	2
72.862 Advanced Medicinal Chemistry II (Autonomic Drugs)	2
72.863 Advanced Medicinal Chemistry III (Anti- Infectives)	2
72.864 Advanced Medicinal Chemistry IV (Cancer Chemotherapy)	2
73.814 Concepts in Pharmacology 1	2
73.816 Concepts in Toxicology 1	2
73.844 Drug Metabolism	2
87.811 Pathophysiology I	2
87.812 Pathophysiology II	2
87.821 Medical Laboratory Management I	2
87.822 Medical Laboratory Management II	2
87.832 Hematology I - Disorders of the Erythrocytes	2
87.833 Immunobiology	2
87.842 Hematology II - Disorders of the Leukocytes	2
87.855 Principles of Medical Endocrinology	2
87.857 Cellular Pathology I	2
87.858 Cellular Pathology II	2
87.861 Adv. Clinical Microbiology I	2

87.862	Adv. Clinical Microbiology II	2
87.866	Interpretive Clinical Chemistry	2
87.890	MLS Seminar: Clinical Chemistry, Hematology, Immunology, Management, Microbiology	1-4
90.824	Applications of Mass Spectrometry	2

Elective Courses

The remaining five quarter hours may be selected from the above courses, as well as from the following and other appropriate courses in the Graduate School of Pharmacy and Allied Health Professions, or in the rest of the University, with the approval of the Director of the M.S. program in Clinical Chemistry.

		<i>Credits</i>
11.871	Radiation Physics	2
11.872	Radiobiology	2
12.841	Inorganic Chemistry I	2
12.842	Inorganic Chemistry II	2
12.846	Coordination Chemistry	2
12.861	Advanced Organic Chemistry I	2
12.862	Advanced Organic Chemistry II	2
12.863	Physical Organic Chemistry	2
12.866	Spectrometric Identification of Compounds	2
12.881	Chemical Thermodynamics I	2
12.885	Introductory Quantum Chemistry	2
12.893	Chemical Kinetics	2
18.245	Serology-Immunology	3
18.835	Genetics and Developmental Biology	2
18.840	Osmotic and Ionic Regulation	2
18.842	Vertebrate Endocrinology	2
18.843	Environmental Physiology	3
18.860	Cell Biophysics and Biochemistry	5
18.909	Animal Virology	4
18.910	Microbial Genetics	3
18.920	Industrial Microbiology	3
18.940	Microbial Biochemistry	4
72.815	Nuclear Medicine I	2
72.816	Nuclear Medicine II	2
72.817	Nuclear Medicine III	2
72.818	Nuclear Medicine IV	2
72.838	Seminar & Report in Clinical Chemistry II	2
72.839	Seminar & Report in Clinical Chemistry III	2
72.844	Seminar and Research Report in Radiopharma- ceutical Science	2
72.865	Special Topics in Medicinal Chemistry	2
72.866	Phytochemistry	2
72.867	Medicinal Chemistry Seminar	2
73.817	Concepts in Toxicology II	2
73.818	Special Topics in Pharmacology	2

Sample Program

Master of Science in Clinical Chemistry

■ Year I

<i>Fall Quarter</i>	<i>Credits</i>	<i>Winter Quarter</i>	<i>Credits</i>
87.810 Functions of the Human Systems	2	87.821 Medical Laboratory Management I	2
90.821 Biochemistry I	2	90.822 Biochemistry II	2
<i>Spring Quarter</i>			
72.845 Radioisotopes in Biological Systems	2		
90.823 Biochemistry III	2		

■ Year II

<i>Fall Quarter</i>		<i>Winter Quarter</i>	
72.834 Advanced Clinical Chemistry I	2	72.835 Advanced Clinical Chemistry II	2
12.821 Analytical Separations	2	12.810 Modern Methods of Analysis	3
<i>Spring Quarter</i>			
72.837 Seminar & Report in Clinical Chemistry I	2		
87.833 Immunobiology	2		

■ Year III

<i>Fall Quarter</i>		<i>Winter Quarter</i>	
10.8H3 Biostatistics	2	73.816 Concepts in Toxicology I	2
73.814 Concepts in Pharmacology I	2	87.857 Cellular Pathology I	2
		87.811 Pathophysiology I	2
<i>Spring Quarter</i>			
72.838 Seminar & Report in Clinical Chemistry II	2		
18.841 Human Genetics	2		
87.812 Pathophysiology II	2		

■ Electives

<i>Fall Quarter</i>		<i>Winter Quarter</i>	
11.871 Radiation Physics	2	11.872 Radiobiology	2
12.824 Special Topics in Analytical Chemistry I	2	12.825 Special Topics in Analytical Chemistry II	2
12.829 Computers in Chemistry	3	12.862 Advanced Organic Chemistry II	2
12.861 Advanced Organic Chemistry I	2	72.815 Nuclear Medicine I	2
12.881 Chemical Thermodynamics I	2	72.817 Nuclear Medicine III	2
12.885 Introductory Quantum Chemistry	2	72.862 Advanced Medicinal Chemistry II (Autonomic Drugs)	2
72.863 Advanced Medicinal Chemistry III (Anti-infectives)	2	72.865 Special Topics in Medicinal Chemistry	2
72.866 Phytochemistry	2	73.844 Drug Metabolism	2
87.890 Seminar	1		
<i>Spring Quarter</i>		<i>Summer Quarter</i>	
12.822 Electroanalytical Chemistry	2	90.824 Applications of Mass Spectrometry	2
12.825 Special Topics in Analytical Chemistry III	2		
12.846 Coordination Chemistry	2		
12.893 Chemical Kinetics I	2		
72.816 Nuclear Medicine II	2		
72.818 Nuclear Medicine IV	2		
72.839 Seminar & Report in Clinical Chemistry III	2		
72.844 Seminar and Research Report in Radiopharmaceutical Science	2		
72.861 Advanced Medicinal Chemistry I (CNS Depressants)	2		
72.864 Advanced Medicinal Chemistry IV (Cancer Chemotherapy)	2		
73.820 Environmental Toxicology	2		
87.822 Medical Laboratory Management II	2		

73.820 Environmental Toxicology	2
73.846 Receptor Pharmacology	2
87.852 Hematology III - Coagulation	2
87.863 Adv. Clinical Microbiology III	2

A minimum of forty quarter hours of graduate credit are necessary for completion of the M.S. degree in Clinical Chemistry.

Part-Time Master of Science Degree Program in Hospital Pharmacy

■ Objectives

Institutional pharmacy constitutes a major area of professional practice. The pharmacist practicing in this environment must show proficiency in both administrative and therapeutic disciplines. The administrative need is essential, since the director of a hospital pharmacy must have managerial competence in order to direct personnel, determine budgets, interact with hospital administration and other departments, and establish guidelines and objectives for the pharmacy. It is the responsibility of the pharmacist to determine the goals and the means for integrating the pharmacy into a high-quality health delivery system.

In addition, a pharmacy director must be knowledgeable about the most modern therapeutic measures, especially as they relate to the preparation and use of drugs. This is the pharmacist's area of expertise. The physician, nurse, and other medical personnel depend upon the modern pharmacist to counsel them in drug usage and selection, contraindication of drugs with specific disease conditions, and problems encountered with drug interactions. The pharmacist's guidance is essential and can only be based upon a comprehensive knowledge of therapeutics.

This program provides modern pharmacists with an opportunity to prepare for such careers in institutional practice.

■ Admission and Program Features

The Director of the M.S. program in Hospital Pharmacy serves as Chairman of the Hospital Pharmacy Academic Standing Committee. The function of this Committee is to evaluate the background of the applicants and advise the Graduate Committee of their suitability for admission to the program. The Director also guides the graduate students in course selection and appraises them of offerings that can help maximize progress toward their individual educational goals.

Admission as a matriculated graduate student is limited to those who possess a B.S. degree in Pharmacy (or an equivalent degree in Pharmacy) from an accredited college of pharmacy. The candidate must have demonstrated an ability to pursue graduate studies as evidenced by undergraduate transcripts and/or other evidence of scholarship. In addi-

tion, a sufficient background in biopharmaceutics and pharmacokinetics, as demonstrated by a challenge exam or other means, will be required of all students.

The program is available on a part-time basis, with courses offered primarily during the evening hours. Courses are scheduled in the fall, winter, spring, and summer quarters. Students are generally expected to complete the degree requirements in a minimum of three years; however, the duration may sometimes be increased or decreased to satisfy the particular needs and requirements of the student. A thesis option is available but not required. Thesis courses are graded on a pass/fail basis. Thesis guidelines are available in the graduate office.

■ Curriculum

The program contains a core curriculum of twenty-two quarter-hour credits of required courses and ten quarter-hour credits to be selected from an elective core consisting of four hours of administrative courses and six hours of therapeutic courses. The required and elective core components total thirty-two quarter hours of credit. In addition, eight hours are to be selected from those graduate courses offered by divisions in the University. The latter courses are to be selected with the guidance of the Director of the M.S. program in Hospital Pharmacy.

<i>Required Courses</i>		<i>Credits</i>
* 45.815	Behavioral Concepts	3
** 45.816	Organizational Behavior I	3
*** 49.932	Introduction to Computer Applications	3
71.822	Seminar in Hospital Pharmacy	2
71.847	Hospital Pharmacy Administration I	3
71.848	Hospital Pharmacy Administration II	3
71.849	Computer Applications in Hospital Pharmacy	3
71.854	Clinical Pharmacy	2
Quarter Hours		<u>22</u>

* These courses, offered through the Graduate School of Business, must be taken together in sequence and meet one evening per week. They are charged at Graduate Business School tuition rates, which are slightly higher than tuition rates for the Graduate School of Pharmacy and Allied Health Professions. There are a limited number of openings for these courses, and guidelines for preregistration must be followed strictly. Students should check with the Graduate School of Pharmacy and Allied Health Professions before registering.

** This course is also offered through the Graduate School of Business and the above criteria also apply.

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Sample Program

Master of Science in Hospital Pharmacy

■ Year 1

<i>Fall Quarter</i>	<i>Credits</i>	<i>Winter Quarter</i>	<i>Credits</i>
45.815 Behavioral Concepts	3	71.847 Hospital Pharmacy Administration I	3
45.816 Organizational Behavior I	3	71.858 Contemporary Therapeutics I	2
71.845 Clinical Pharmacy	2		
<i>Spring Quarter</i>		<i>Summer Quarter</i>	
71.848 Hospital Pharmacy Administration II	3	71.822 Seminar in Hospital Pharmacy	2
71.859 Contemporary Therapeutics II	2		

■ Year 2

<i>Fall Quarter</i>		<i>Winter Quarter</i>	
71.860 Drug Monitoring Elective	2 2	49.932 Introduction to Computer Science	3
		71.861 Sterile Products	2
<i>Spring Quarter</i>			
71.849 Computer Applications in Hospital Pharmacy	3		
71.850 Health Care Administration	3		

■ Year 3

<i>Fall Quarter</i>		<i>Winter Quarter</i>	
71.823 Legal Aspects/Federal Legislation in Pharmacy Elective	2 2	Electives	4
<i>Spring Quarter</i>			
71.855 Human Relations in Health Care	2		

■ Electives

Fall Quarter

5.860 Health Care Organization and Management	2
10.8H3 Biostatistics	2
41.816 Management Control of Health Service Systems	3
72.834 Advanced Clinical Chemistry I	2
63.814 Grantsmanship	4
73.814 Concepts in Pharmacology I	2

Spring Quarter

10.8H3 Biostatistics	2
71.816 Clinical Pharmacokinetics	2
72.845 Radioisotopes in Biological Systems	2
73.820 Environmental Toxicology	2
87.812 Pathophysiology II	2

Winter Quarter

39.9H1 Economics of Medical Care and Health Manpower	3
72.835 Advanced Clinical Chemistry II	2
73.816 Concepts in Toxicology I	2
73.844 Drug Metabolism	2
87.811 Pathophysiology I	2

Summer Quarter

5.913 Data Processing	3
45.838 Policy Formation in Health Care	2

*Elective Core**Administrative Core*

71.823	Legal Aspects/Federal Legislation in Pharmacy	2
71.850	Health Care Administration	3
71.855	Human Relations in Health Care	2
Quarter Hours Required: 4		

Therapeutic Courses

71.858	Contemporary Therapeutics I	2
71.859	Contemporary Therapeutics II	2
71.860	Drug Monitoring	2
71.861	Sterile Products	2
Quarter Hours Required: 6		

<i>Total Required Courses and Elective Core</i>	32
<i>Electives</i>	8

<i>Total Program (quarter hours):</i>	40
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<i>Elective Courses</i>	<i>Credits</i>
10.8H3 Biostatistics	2
71.904 Hospital Pharmacy Thesis	2-8
72.834 Advanced Clinical Chemistry I	2
72.835 Advanced Clinical Chemistry II	2
72.845 Radioisotopes in Biological Systems	2
73.814 Concepts in Pharmacology I	2
73.816 Concepts in Toxicology I	2
73.820 Environmental Toxicology	2
73.844 Drug Metabolism	2
87.811 Pathophysiology I	2
87.812 Pathophysiology II	2

A maximum of ten quarter hours of credit may be taken from the following courses:

	<i>Credits</i>
5.860 Health Care Organization and Management	2
5.913 Data Processing	2
21.840 Sociology of Medicine	3
21.850 Sociology of Occupations and Professions	3
22.868 Politics of Health Care Administration	3
39.9H1 Economics of Medical Care and Health Man- power	3
41.811 Financial and Managerial Accounting	3
41.816 Management Control of Health Service Systems	3
43.814 Consumer Behavior	3
45.811 Purchasing and Materials Management	3
45.817 Organizational Behavior II	3
45.824 Organizational Behavior in a Nonprofit Environ- ment	3
45.833 Operations Management in the Health Care System	3

48.838	Policy Formation in Health Care	3
45.951	Executive Development	3
45.972	Labor Relations	3
45.977	Information Systems for Health Care Facilities	3
45.978	Regulation and the American Health Care Industry	3
45.979	Integrative Models in Health Care	3
50.807	Abnormal Psychology	4
63.814	Grantsmanship	4

Part-Time Master of Science Degree Program in Medical Laboratory Science

■ Objectives

This program provides the opportunity for medical laboratory scientists to acquire increased expertise in laboratory science and in clinical laboratory research and development.

The program offers preparation for students who are interested in contributing to the modern medical laboratory. It is designed to assist them in developing the ability to search literature, to find and test available methodologies and to develop, modify, and evaluate new methods. Graduates of the program have normally fulfilled requirements necessary to achieve positions as qualified associates in the clinical pathology department. The graduate courses in administration and education offered in this program, together with those offered in the Graduate Schools of Business Administration and Education at Northeastern, offer students the opportunity to prepare for administrative or teaching positions.

■ Admission and Program Features

To be enrolled for graduate work, the applicant must hold a baccalaureate degree from a recognized institution and provide evidence of ability to pursue a program of graduate study as determined by the Graduate Committee. The applicant's scholastic record must show distinction, with adequate preparation in the sciences, including one year each of organic chemistry, college physics, and mathematics; one complete course of analytical chemistry; and a minimum of twenty-four quarter hours, or the equivalent, of biological sciences including basic microbiology, human physiology, genetics, and cell biology. Requirements in human physiology, genetics, and cell biology may be completed at the graduate level. Students admitted with deficiencies must complete them during the first twelve quarter hours of graduate work. Under certain circumstances, students may be allowed to take equivalency exams to remove any deficiencies.

Acceptance to the school is upon recommendation of the Medical Laboratory Science Academic Standing Committee and approval by the Graduate Committee of the Graduate School of Pharmacy and Allied Health Professions. Students are generally expected to complete the degree requirements in a minimum of three years. However, in some cases this timing may be increased or decreased to satisfy a student's particular needs and requirements. A limited number of teaching assistantships are available for exceptional students wishing to pursue their studies full time.

■ Blood Banking Specialist Option

A limited number of students may be accepted into the Specialist in Blood Banking Program, which is offered jointly by the New England Deaconess Hospital and Northeastern University. As part of their graduate education, students will be expected to complete a one-year residency program at the New England Deaconess Hospital. Students interested in this option should contact either the director of the Blood Bank Program at the New England Deaconess Hospital or the director of the Medical Laboratory Science graduate program at Northeastern.

■ Professional Requirement

Upon completion of the Master of Science degree, the student must have written, or be eligible to write, the examination in medical technology or in one of the categorical or specialist certifications of the Board of Registry of the American Society of Clinical Pathologists. Students intending to complete their professional requirements in an approved hospital school of medical technology must also apply directly to the hospital program. Acceptance to the graduate program in medical laboratory science does not imply concomitant acceptance to a hospital program.

Certain students may be given the opportunity to complete their professional requirement through a hospital affiliated with Northeastern University. Only those students completing their professional course requirements through Northeastern may receive a maximum of eight quarter hours of graduate credit.

■ Curriculum

The program contains a core curriculum of fifteen quarter-hour credits of required courses and twelve quarter-hour credits selected from an elective core. In addition, thirteen hours must be selected from graduate courses offered by the Graduate School of Pharmacy and Allied Health Professions or by other divisions in the University. The latter courses must be selected with the guidance of the Director of the M.S. program in Medical Laboratory Science. A total of forty quarter hours of academic work are required for this program.

In addition to the required course 87.990 Research Report I, each student working toward the degree of Master of Science in Medical Laboratory Science may elect to take either 87.991 Research Report II

(two to four q.h. of credit) or 87.992 MLS Thesis (six q.h. of credit). Students selecting 87.992 must register for this course three times (two credits each). Grades for 87.990, 87.991, and 87.992 are recorded as Satisfactory or Unsatisfactory. Two unsatisfactory grades in 87.992 result in the student's dismissal from the thesis portion of the program.

The research report (87.990, 87.991) may take the form of a comprehensive, critical review of the literature in a specialized area, design of a learning package, and/or a specific program of experimental work on a single topic. Research Report I may be expanded, with the permission of the student's research adviser, into a master's thesis with a topic, adviser, and committee composed of not less than three members. Students who wish to continue their Research Report I topic, but who do not wish to pursue a thesis, may do so by selecting Research Report II. Research Report II may not be extended into a thesis. MLS thesis culminates in a final oral thesis defense. Thesis guidelines are available in the graduate office.

■ Comprehensive Examination

A written comprehensive examination consisting of both a morning and an afternoon session is required of all students not presenting a thesis. The morning session includes questions reflecting required courses in biostatistics, pathophysiology, and biochemistry. The afternoon session includes questions in the student's area of interest, i.e., blood banking, hematology, clinical microbiology, clinical chemistry, or education-management. This pass/fail exam is offered yearly during the spring quarter to students with a minimum of thirty q.h. of course work. Students failing the examination are given one opportunity to remove this failure.

<i>Required Courses</i>		<i>Credits</i>
10.8H3	Biostatistics	2
87.811	Pathophysiology I	2
87.812	Pathophysiology II	2
87.990	Graduate Research Report I	2
90.821	Biochemistry I	2
90.822	Biochemistry II	2
Seminars (3): 1 quarter hour each (87.890 or from other graduate programs)		3
Total Quarter Hours		15

Elective Core

A minimum of twelve credits must be taken from the following list:

72.834	Advanced Clinical Chemistry I	2
72.835	Advanced Clinical Chemistry II	2
87.816	Principles of Hematology and Coagulation Related to Transfusion	3
87.821	Medical Laboratory Management I	2
87.826	Health Science Education I	2
87.832	Hematology I—Disorders of the Erythrocytes	2
87.833	Immunobiology	2

87.842	Hematology II—Disorders of the Leukocytes	2
87.845	Epidemiology	2
87.852	Hematology III—Hemostasis	2
87.855	Principles of Medical Endocrinology	2
87.861	Advanced Clinical Microbiology I	2
87.862	Advanced Clinical Microbiology II	2
87.863	Advanced Clinical Microbiology III	2
87.866	Interpretive Clinical Chemistry	2
87.874	Genetic and Immunological Aspects of Blood Group Identification	1
87.876	Principles and Foundations of the Blood Group Systems	2

A minimum of one course in Hematology (87.832, 87.842, or 87.852), one course in Advanced Clinical Microbiology (87.861, 87.862, or 87.863), one course in Advanced Clinical Chemistry (72.834 or 72.835), and one course in Blood Banking (87.816, 87.874, or 87.876) must be taken as part of the elective core. Appropriate seminar courses (87.890) may be substituted for the above, e.g., one seminar in microbiology for Advanced Clinical Microbiology (87.861, 87.862, or 87.863).

Elective Courses

Selection may be made from other courses in the elective core or from the following. Students may choose all electives in one area, i.e., the laboratory sciences, health science education, or laboratory administration.

		<i>Credits</i>
5.913	Data Processing	2
18.211	Parasitology	4
18.240	Microbial Physiology	4
18.242	Medical Microbiology	2
18.245	Serology—Immunology	3
18.246	Serology—Immunology Laboratory	2
18.842	Vertebrate Endocrinology	2
18.857	Experimental Mammalian Physiology	4
18.860	Cell Biophysics and Biochemistry	5
18.863	General Neurophysiology	2
18.864	Neurophysiology Laboratory	2
18.869	Nervous Control of Homeostatic Functions	3
18.872	The Gastrointestinal Tract	3
18.903	Environmental Microbiology	4
18.906	Food Microbiology	4
18.908	Food Microbiology Laboratory	2
18.910	Microbial Genetics	3
18.911	Microbial Genetics Laboratory	2
18.912	Animal Virology	3
18.913	Virology Laboratory	2
18.936	Cell Physiology and Biochemistry	2
18.940	Microbial Biochemistry	4

		<i>Credits</i>
21.840	Sociology of Medicine	3
21.843	Sociology of Education	3
21.847	Formal Organizations: Administration and Structure	3
21.850	Sociology of Occupations and Professions	3
21.910	The Sociology of Science	3
22.868	Health Care Administration	3
22.882	Public Personnel Administration	3
22.899	Human Resources Policy and Administration	3
22.988	Health Policy and Politics	3
39.9G7	Human Resources and Labor Problems and Policies	3
39.9H1	Economics of Medical Care and Health Manpower	3
39.9H3	Economics of Education	3
41.817	Fiscal Planning, Budgeting and Control of Health Care Institutions	3
45.805	Operations Management I and II	3
45.815	Behavioral Concepts	3
45.819	Interpersonal Behavior	3
45.833	Operations Management in the Health Care System	3
45.951	Executive Development	3
45.971	Personnel Management	3
45.975	Introduction to Health Care Systems	3
45.976	Workers in the Health Care System	3
45.977	Information Systems for Health Care Facilities	3
50.815	Research Design	2
50.817	Advanced Research Design in Education	2
52.817	Design, Production and Utilization of Instructional Materials	4
52.818	Developing Curriculum Learning	4
52.820	Principles of Programmed Learning	4
52.821	Administration of Instructional Media Programs	4
52.846	Developing Curriculum in Learning Packages (Advanced)	4
71.850	Health Care Administration	3
71.855	Human Relations in Health Care	2
72.845	Radioisotopes in Biological Systems	2
72.863	Advanced Medicinal Chemistry III	2
72.864	Advanced Medicinal Chemistry IV	2
73.814	Concepts in Pharmacology I	2
73.816	Concepts in Toxicology I	2
73.817	Concepts in Toxicology II	2
73.818	Special Topics in Pharmacology	2
73.820	Environmental Toxicology	2
87.810	Functions of the Human Systems	2

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Sample Program

Master of Science in Medical Laboratory Science

■ Year I

<i>Fall Quarter</i>	<i>Credits</i>	<i>Winter Quarter</i>	<i>Credits</i>
10.8H3 Biostatistics or Specialization Elective	2	87.811 Pathophysiology I	2
90.821 Biochemistry I	2	90.822 Biochemistry II	2
<i>Spring Quarter</i>			
87.812 Pathophysiology I	2		
10.8H3 Biostatistics or Elective	2		

■ Year II

<i>Fall Quarter</i>		<i>Winter Quarter</i>	
87.990 Graduate Research Report I	2	87.890 Seminar	1
Specialization Elective	2	Specialization Electives	4
Seminar	1		
<i>Spring Quarter</i>			
Specialization Electives	4		

■ Year III

<i>Fall Quarter</i>		<i>Winter Quarter</i>	
Specialization Electives	4	Specialization Electives	5
Seminar	1		
<i>Spring Quarter</i>			
Specialization Electives	4		

■ Electives

<i>Fall Quarter</i>		<i>Winter Quarter</i>	
10.8H3 Biostatistics	2	18.211 Parasitology	4
18.211 Parasitology	4	18.242 Medical Microbiology	2
18.910 Microbial Genetics	3	18.245 Immunology and Serology	3
50.815 Research Design in Education	2	18.246 Immunology and Serology Laboratory	2
72.834 Advanced Clinical Chemistry I	2	39.9H1 Economics of Medical Care and Health Manpower	3
72.863 Advanced Medicinal Chemistry III	2	50.815 Research Design in Education	2
73.814 Concepts in Pharmacology I	2	50.817 Research Problems in Education	2
87.810 Functions of the Human Systems	2	71.852 Health Care Administration I	2
87.826 Health Science Education I	2	72.835 Advanced Clinical Chemistry II	2
87.855 Principles of Medical Endocrinology	2	73.816 Concepts in Toxicology I	2
87.870 Immunohematology Administration	2	73.844 Drug Metabolism	2
		87.811 Pathophysiology I	2

Cont.

Cont.

Fall Quarter, Cont.

87.871	Immunohematology Administration Laboratory	2
87.872	Transfusion Therapy	2
87.873	Transfusion Therapy Laboratory	2
87.990	Graduate Research Report I	2
87.991	Graduate Research Report II	2-4
87.992	Medical Laboratory Science Thesis	6

Spring Quarter

18.903	Environmental Microbiology	4
18.940	Microbial Biochemistry	4
21.840	Sociology of Medicine	3
39.9G7	Public Policy in Manpower	3
50.815	Research Design in Education	2
71.850	Health Care Administration	3
72.864	Advanced Medicinal Chemistry IV	2
73.817	Concepts in Toxicology II	2
73.818	Special Topics in Pharmacology	2
73.820	Environmental Toxicology	2
87.812	Pathophysiology II	2
87.816	Principles of Hematology & Coagulation Related to Transfusion	3
87.822	Medical Lab. Management II	2
87.828	Health Science Education III	2
87.833	Immunobiology	2
87.878	The Design & Problems of Compatibility Testing	1
87.879	The Design & Problems of Compatibility Testing II	2
87.990	Graduate Research Report I	2
87.991	Graduate Research Report II	2-4
87.992	Medical Laboratory Science Thesis	6
90.823	Biochemistry III	2

Winter Quarter, Cont.

87.821	Medical Laboratory Management I	2
87.827	Health Science Education II	2
87.845	Epidemiology	2
87.866	Interpretive Clinical Chemistry	2
87.874	Genetic and Immunologic Aspects of Blood Group Identification	1
87.875	Genetic and Immunologic Aspects of Blood Group Identification Laboratory	1
87.876	Principles and Foundations of the Blood Group Systems	2
87.877	Principles and Foundations of the Blood Group Systems Laboratory	2
87.990	Graduate Research Report I	2
87.991	Graduate Research Report II	2-4
87.992	Medical Laboratory Science Thesis	6

Summer Quarter

18.903	Environmental Microbiology	4
18.905	Marine Microbiology	4
50.815	Research Design in Education	2
87.990	Graduate Research Report I	2
87.991	Graduate Research Report II	2-4
87.992	Medical Laboratory Science Thesis	6
90.821	Biochemistry I	2
90.822	Biochemistry II	2

87.822	Medical Laboratory Management II	2
87.827	Health Science Education II	2
87.828	Health Science Education III	2
87.857	Cellular Pathology I	2
87.858	Cellular Pathology II	2
87.870	Immunohematology Administration	2
87.871	Immunohematology Administration Laboratory	2
87.872	Transfusion Therapy	2
87.873	Transfusion Therapy Laboratory	2
87.875	Genetic and Immunological Aspects of Blood Group Identification Laboratory	2
87.877	Principles and Foundations of the Blood Group Systems Laboratory	2
87.878	The Design and Problems of Compatibility Testing	1
87.879	The Design and Problems of Compatibility Testing Laboratory	2
87.991	Graduate Research Report II	2-4
87.992	MLS Thesis	6
90.823	Biochemistry III	2

Part-Time Master of Science Degree Program in Medicinal Chemistry

■ Objectives

The primary goal of this program is to provide an opportunity for interested professionals to participate in one of the following areas: the rational synthesis, isolation, and analysis of drugs; the understanding of the chemical mechanisms by which these compounds function in mammalian systems; and the study of the metabolism of such biologically active agents. For this purpose the program is composed of four distinct areas of study: medicinal chemistry, pharmacology and toxicology, biochemistry, and organic chemistry. This type of background offers preparation to an individual interested in using chemistry for biological and clinical purposes. The medical research team needs scientists with this training and orientation.

■ Admission and Program Features

The Director of the M.S. program in Medicinal Chemistry serves as the Chairman of the Medicinal Chemistry Academic Standing Committee, which evaluates applicants' background and advises the Graduate Committee of the applicants' suitability for admission to the program. In addition, the Director aids graduate students in course selection and apprises them of the offerings that maximize their opportunity to achieve their individual educational goals.

Application for admission to this program is welcomed from any individual who has obtained, from a recognized institution, a baccalaureate degree in pharmacy, chemistry, biology, or a related program within the biological or physical sciences. An applicant's undergraduate record must also indicate a high level of previous work and sufficient background in organic chemistry, mathematics, and biology. Applicants with deficiencies in these areas may be admitted as conditional students. Students admitted with deficiencies must rectify them during the first twelve quarter hours of graduate work.

The program is available on a part-time or full-time basis, with courses offered primarily during the evening hours. Courses are scheduled in the fall, winter, spring, and summer quarters. Students generally complete the degree requirement in a minimum of three years; however, in some cases the timing may be increased or decreased to satisfy the particular needs and requirements of the student. Students wishing to carry out an independent research program may do so, but neither a research project nor a thesis is required. Thesis guidelines are available in the graduate office.

The Graduate School recognizes the divergent backgrounds and goals of individuals who may be accepted into this program. Accordingly, the program is designed to offer flexibility in course selection to help maximize its relevance to the student's career objectives.

■ General Requirements

A candidate must complete a minimum of forty quarter hours of graduate work. A total of thirty required credits must be taken. The additional seven credits should be taken from the elective sequence.

An individual who has deficiencies in any of the areas required for admission may take appropriate courses at Northeastern University concurrently with graduate courses that do not require the deficient prerequisites. The appropriate evening courses offered at University College of Northeastern University are: Analytical Chemistry 12.421-12.423 or 12.427; Organic Chemistry 12.431-12.433; Physical Chemistry 12.441-12.443; and Human Anatomy and Physiology 18.424-18.426. Equivalent courses from this University or other accredited universities are usually accepted.

■ Curriculum

<i>Core Courses</i>		<i>Credits</i>
12.861	Advanced Organic Chemistry I	2
12.862	Advanced Organic Chemistry II	2
12.863	Physical Organic Chemistry I	2
12.864	Stereochemistry and Mechanisms of Organic Reactions I	2
12.866	Spectrometric Identification of Organic Reactions	2
* 12.953	Identification of Organic Compounds	3
* 72.808	Isolation & Identification of Natural Products	3

42/Fields of Study

*72.812	Advanced Drug Synthesis	3
72.861	Advanced Medicinal Chemistry I (CNS Depressants)	2
72.862	Advanced Medicinal Chemistry II (Autonomic Drugs)	2
72.863	Advanced Medicinal Chemistry III (Anti-infectives)	2
72.864	Advanced Medicinal Chemistry IV (Cancer Chemotherapy)	2
73.814	Concepts in Pharmacology I	2
73.816	Concepts in Toxicology I	2
73.844	Drug Metabolism	2
87.810	Functions of the Human Systems	2
90.821	Biochemistry I	2
90.822	Biochemistry II	2
	Quarter Hours	33
<i>Electives</i>		
72.834	Advanced Clinical Chemistry I	2
72.835	Advanced Clinical Chemistry II	2
72.850	Biomedical Science Colloquium	2
	or	
72.867	Medicinal Chemistry Seminar	2
72.865	Special Topics in Medicinal Chemistry	2
72.866	Phytochemistry	2
72.885	Heterocyclics in Medicinal Chemistry	2
72.903	Medicinal Chemistry Thesis	2-6
73.818	Special Topics in Pharmacology	2
73.820	Environmental Toxicology	2
73.829	Experimental Pharmacology	2
90.823	Biochemistry III	2
90.824	Applications of Mass Spectrometry	2

*One of these three core courses should be taken.

Sample Program

Master of Science in Medicinal Chemistry

■ Year I

<i>Fall Quarter</i>	<i>Credits</i>	<i>Winter Quarter</i>	<i>Credits</i>
12.861 Advanced Organic Chemistry I	2	12.862 Advanced Organic Chemistry II	2
87.810 Functions of Human Systems	2	90.822 Biochemistry II	2
90.821 Biochemistry I	2		
<i>Spring Quarter</i>		<i>Summer Quarter</i>	
12.863 Physical Organic Chemistry I	2	72.867 Medicinal Chemistry Seminar	2
12.866 Spect. Ident. Organic Compounds	2	72.903 Medicinal Chemistry Thesis	2-6

■ Year II

<i>Fall Quarter</i>		<i>Winter Quarter</i>	
12.864 Stereochemistry and Mechanisms of Organic Reactions	2	72.862 Advanced Medicinal Chemistry II	2
72.863 Advanced Medicinal Chemistry III	2	73.816 Concepts in Toxicology I	2
73.814 Concepts in Pharmacology I	2		
<i>Spring Quarter</i>			
72.861 Advanced Medicinal Chemistry I	2		
72.864 Advanced Medicinal Chemistry IV	2		

■ Year III

<i>Fall Quarter</i>		<i>Winter Quarter</i>	
72.865 Special Topics in Medicinal Chemistry	2	73.844 Drug Metabolism Elective	2
<i>Spring Quarter</i>			
Elective	2		

■ Electives

Fall Quarter

72.834 Advanced Clinical Chemistry I	2
72.850 Biomedical Science Colloquium	2
72.866 Phytochemistry	2
72.903 Medicinal Chemistry Thesis	2-6
73.818 Special Topics in Pharmacology	2

Spring Quarter

12.953 Identification of Organic Compounds	3
72.850 Biomedical Science Colloquium	2
72.903 Medicinal Chemistry Thesis	2-6
73.820 Environmental Toxicology	2
73.829 Experimentation in Pharmacology	2
90.823 Biochemistry III	2

Winter Quarter

72.808 Identification & Isolation of Natural Products	3
72.812 Advanced Drugs Synthesis	3
72.835 Advanced Clinical Chemistry II	2
72.850 Biomedical Science Colloquium	2
72.885 Heterocyclic Drugs in Medicinal Chemistry	2
72.903 Medicinal Chemistry Thesis	2-6

Summer Quarter

72.808 Identification and Isolation of Natural Products	3
72.812 Advanced Drug Synthesis	3
72.867 Medicinal Chemistry Seminar	2
72.903 Medicinal Chemistry Thesis	2-6
90.821 Biochemistry I	2
90.822 Biochemistry II	2
90.824 Applications of Mass Spectrometry	2

Part-Time Master of Science Degree Program in Pharmacology

■ Objectives

The pharmacologist is concerned with the discovery, testing, and perfecting of drugs and the study of how they act, especially in mammalian systems. With the increasing concern of pharmaceutical companies, hospitals, and research institutions for knowledge of the mechanisms by which drugs produce their effects, the role of the pharmacologically trained scientist is ever expanding. In the education of such an individual, a broad background in pharmacology, physiology, anatomy, instrumentation, and chemistry is essential. The goal of Northeastern's program is to meet this objective and to provide individuals the opportunity to prepare themselves to make significant contributions in the many areas requiring pharmacological expertise.

■ Admission and Program Features

The Director of the M.S. program in Pharmacology serves as Chairman of the Pharmacology Academic Standing Committee, which evaluates applicants' backgrounds and advises the Graduate Committee of their suitability for admission to the program. In addition, the Director guides the graduate students in course selection and apprises them of the offerings that maximize their opportunities to achieve their individual educational goals.

Application for admission as a graduate student is welcomed from any individual who has obtained, from a recognized institution, a baccalaureate degree in pharmacy, chemistry, biology, or related programs within the biological or physical sciences. The applicant's undergraduate record must also indicate sufficient background in organic chemistry, mathematics, and biology. However, applicants with deficiencies in these areas may be admitted as conditional students. Students admitted with deficiencies must remove them during the first twelve quarter hours of graduate work.

The program is available on a part-time basis, with courses offered primarily during the evening hours. Courses are scheduled in the fall, winter, spring, and summer quarters. Students generally complete the degree requirements in a minimum of three years, but may sometimes take more or less time depending on their individual needs. A thesis option is available for a maximum of eight credits but is not required. Thesis and research courses are graded on a pass/fail basis. Thesis guidelines are available in the graduate office.

The Graduate School recognizes the divergent backgrounds and goals of individuals who may be accepted into this program. Accordingly, the program is designed to offer a diverse course selection to help maximize its relevance to the student's career objectives.

■ General Requirements

A candidate must complete a minimum of forty quarter hours of graduate work. A total of twenty-eight required credits must be taken. The additional twelve quarter hours may be selected from graduate courses in the Graduate School of Pharmacy and Allied Health Professions or in other divisions of the University. Selection of the elective courses should be approved by the Director of the M.S. program in Pharmacology.

■ Comprehensive Examination

All students are required to take a comprehensive examination. This pass-fail exam is offered early in the spring quarter to students with a minimum of thirty-four quarter hours of work. Students failing the examination are given one more opportunity to pass.

■ Curriculum

<i>Required Courses</i>		<i>Credits</i>
10.8H3	Biostatistics	2
71.106	Introduction to Biopharmaceutics and Pharmacokinetics	2
73.814	Concepts in Pharmacology I	2
73.816	Concepts in Toxicology I	2
73.829	Experimental Pharmacology	2
73.844	Drug Metabolism	2
73.870	Pharmacology Seminar	2
* 73.873	Pharmacological Basis of Therapeutics I	2
* 73.874	Pharmacological Basis of Therapeutics II	2
87.810	Functions of the Human Systems (or equivalent)	2
87.811	Pathophysiology I	2
90.821	Biochemistry I	2
90.822	Biochemistry II	2
90.823	Biochemistry III	2
Quarter Hours		28

Elective Courses

Of the twelve elective course credits required, at least four credits must be drawn from the following pharmacology offerings:

Pharmacology Electives

73.817	Concepts in Toxicology II	2
73.820	Environmental Toxicology	2
* 73.846	Receptor Pharmacology	2
* 73.847	Drug Dependence	2
73.904	Pharmacology Thesis	2-8
* Course offered in alternate years.		

Other Electives

18.834	Environmental and Population Biology	2
18.835	Genetics and Development Biology	2
18.836	Cardiovascular Physiology	3
18.842	Vertebrate Endocrinology	2
18.843	Environmental Physiology	2
18.857	Experimental Mammalian Physiology	4
18.860	Cell Biophysics and Biochemistry	5
18.863	Neurophysiology	2
18.912	Animal Virology	3
18.993	Biological Electron Microscopy	4
71.858	Contemporary Therapeutics I	2
72.834	Advanced Clinical Chemistry I	2
72.835	Advanced Clinical Chemistry II	2
72.845	Radioisotopes in Biological Systems	2
72.861	Advanced Medicinal Chemistry I (CNS Depressants)	2
72.862	Advanced Medicinal Chemistry II (Autonomic Drugs)	2
72.863	Advanced Medicinal Chemistry III (Anti- infectives)	2
72.864	Advanced Medicinal Chemistry IV (Cancer Chemotherapy)	2
72.865	Special Topics in Medicinal Chemistry	2
73.820	Environmental Toxicology	2
73.871	Research Report in Pharmacology I	2
73.872	Research Report in Pharmacology II	2
87.812	Pathophysiology II	2
87.833	Immunobiology	2
90.824	Applications of Mass Spectrometry	2

Additional electives may be selected from other appropriate graduate courses in the University with the approval of the Director of the M.S. program in Pharmacology and the course instructor.

Sample Program

Master of Science in Pharmacology

■ Year I

<i>Fall Quarter</i>	<i>Credits</i>	<i>Winter Quarter</i>	<i>Credits</i>
73.814 Concepts of Pharmacology I	2	87.811 Pathophysiology I	2
87.810 Functions of Human Systems	2	73.816 Concepts in Toxicology I	2
90.821 Biochemistry I	2	90.822 Biochemistry II	2
<i>Spring Quarter</i>			
73.870 Pharmacology Seminar	2		
90.823 Biochemistry III Elective	2		

■ Year II

<i>Fall Quarter</i>		<i>Winter Quarter</i>	
10.8H3 Biostatistics	2	73.844 Drug Metabolism	2
71.815 Introduction to Biopharmaceutics and Pharmacokinetics	2	73.873 Pharmacological Basis of Therapeutics I	2
Elective	2		
<i>Spring Quarter</i>			
73.829 Experimental Pharmacology	2		
73.874 Pharmacological Basis of Therapeutics II	2		

■ Year III

<i>Fall Quarter</i>		<i>Winter Quarter</i>	
Electives	2	Electives	2
<i>Spring Quarter</i>			
Electives	4		

■ Electives

Fall Quarter

18.842 Vertebrate Endocrinology	2
72.834 Advanced Clinical Chemistry I	2
72.863 Advanced Medicinal Chemistry III (Anti-infectives)	2
72.865 Special Topics in Medicinal Chemistry	2
72.904 Pharmacology Thesis	2-8

Spring Quarter

18.843 Environmental Physiology	2
72.845 Radioisotopes in Biological Systems	2
72.861 Advanced Medicinal Chemistry I (CNS Depressants)	2
72.864 Advanced Medicinal Chemistry IV (Cancer Chemotherapy)	2
73.820 Environmental Toxicology	2
73.846 Receptor Pharmacology	2
73.871 Research Report in Pharmacology I	2
73.872 Research Report in Pharmacology II	2
73.904 Pharmacology Thesis	2-8
87.812 Pathophysiology II	2
87.833 Immunobiology	2
87.843 Immunobiology Lab	2

Winter Quarter

18.835 Genetics and Developmental Biology	2
72.835 Advanced Clinical Chemistry II	2
72.862 Advanced Medicinal Chemistry II (Autonomic Drugs)	2
73.847 Drug Dependence	2
73.904 Pharmacology Thesis	2-8
87.811 Pathophysiology I	2

Summer Quarter

73.904 Pharmacology Thesis	2-8
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Part-Time Master of Science Degree Program in Radiopharmaceutical Science

■ Objectives

During the last decade many new experimental tools and methods have been placed in the hands of professionals and practitioners in the allied health professions. These have been used to probe more widely and more deeply into the nature of clinical problems. Of all the new techniques, none has been employed in more diverse means nor yielded greater rewards than the use of radioactive isotopes for both diagnostic and therapeutic procedures.

There is a critical need for individuals with background and training in the area of radiopharmaceuticals and radiochemicals. For qualified individuals, employment opportunities may be available in the pharmaceuticals industry, hospitals, and various clinical and chemical laboratories. The function of this program is to provide students with the opportunity to develop the necessary in-depth knowledge to meet these needs.

■ Admission and Program Features

The Director of the M.S. program in Radiopharmaceutical Science serves as Chairman of the Radiopharmaceutical Science Academic Standing Committee, which evaluates applicants' background and advises the Graduate Committee of their suitability for admission to the program. The Director also guides the students in course selection and apprises them of the offerings that maximize their opportunities to achieve their individual educational goals.

Applicants for this program must have completed a baccalaureate program in pharmacy, biology, chemistry, medical technology, physics, or a related field. Undergraduate requirements are: a minimum of two quarters of organic chemistry, one quarter of analytical chemistry or its equivalent, two quarters of human physiology, and one quarter of physics. An individual who has deficiencies in any of these areas may take appropriate courses at Northeastern University or at any other recognized institution concurrently with those graduate courses which do not require the deficient prerequisites. Students admitted with deficiencies must rectify them during the first twelve quarter hours of graduate work.

The program is available on a part-time basis, with courses offered primarily during the evening hours. Courses are scheduled in the fall, winter, spring, and summer quarters. Students generally complete the degree requirements in a minimum of three years; however, the time spent may increase or decrease depending on the particular needs and requirements of the student. Students may carry out an independent research program, although neither a research project nor a thesis is required. Thesis guidelines are available in the Graduate Office.

The Graduate Committee recognizes the divergent backgrounds and goals of individuals who may be accepted into this program. Accordingly, the program is designed to offer flexibility in course selection to maximize its relevance to the student's career objectives.

■ Curriculum

<i>Required Courses</i>		<i>Credits</i>
10.8H3	Biostatistics	2
11.871	Radiation Physics	2
11.872	Radiobiology	2
72.815	Nuclear Medicine I: Instrumentation	2
72.816	Nuclear Medicine II: Instrumentation	2
72.817	Nuclear Medicine III: Radiopharmaceuticals	2
72.818	Nuclear Medicine IV: Radiopharmaceuticals Laboratory	2
72.844	Seminar and Research Report in Radiopharmaceutical Science	2
72.847	Dosimetry and Health Physics	2
72.848	Clinical Aspects of Nuclear Medicine	2
72.849	Radiopharmacy Internship	2
90.821	Biochemistry I	2
Quarter Hours		24

Elective Core

A minimum of ten credits must be taken from the following list:

72.834	Advanced Clinical Chemistry I	2
72.835	Advanced Clinical Chemistry II	2
72.863	Advanced Medicinal Chemistry III (Anti-infectives)	2
72.864	Advanced Medicinal Chemistry IV (Cancer Chemotherapy)	2
72.870	Radiopharmaceutical Research Report I	2
73.814	Concepts in Pharmacology I	2
73.816	Concepts in Toxicology I	2
73.817	Concepts in Toxicology II	2
73.820	Environmental Toxicology	2
73.844	Drug Metabolism	2
87.810	Functions of the Human Systems	2
87.811	Pathophysiology I	2
87.812	Pathophysiology II	2
90.822	Biochemistry II	2
90.823	Biochemistry III	2

Additional Electives

These are to be taken with the approval of the Director of Radiopharmaceutical Science and the course instructor. Selection may be made from the above courses, as well as from the following and from other appropriate graduate courses in the University. Course availability is subject to change.

		<i>Credits</i>
12.841	Advanced Inorganic Chemistry I	2
12.842	Advanced Inorganic Chemistry II	2
12.846	Coordination Chemistry	2
12.861	Advanced Organic Chemistry I	2
12.862	Advanced Organic Chemistry II	2
12.866	Spectrometric Identification of Compounds	2
18.245	Serology-Immunology	3
18.835	Mammalian Physiology	4
18.840	Osmotic and Ionic Regulation	2
18.842	Vertebrate Endocrinology	2
18.843	Environmental Physiology	3
72.865	Special Topics in Medicinal Chemistry	2
73.822	Pathology	2
87.833	Immunobiology	2

A minimum of forty quarter hours of graduate credit is necessary for completion of the Master of Science degree in Radiopharmaceutical Science.

Sample Program

Master of Science in Radiopharmaceutical Science

■ Year I

<i>Fall Quarter</i>	<i>Credits</i>	<i>Winter Quarter</i>	<i>Credits</i>
10.8H3 Biostatistics or Elective	2	11.871 Radiation Physics	2
Elective	2	72.815 Nuclear Medicine I	2
<i>Spring Quarter</i>			
10.8H3 Biostatistics or Elective	2		
11.872 Radiobiology	2		
72.816 Nuclear Medicine II	2		

■ Year II

<i>Fall Quarter</i>		<i>Winter Quarter</i>	
90.821 Biochemistry I	2	72.817 Nuclear Medicine III	2
Elective	2	Elective	2
<i>Spring Quarter</i>			
72.818 Nuclear Medicine IV	2		
Elective	2		

■ Year III

<i>Fall Quarter</i>		<i>Winter Quarter</i>	
72.847 Dosimetry and Health Physics	2	72.844 Seminar and Research Report	2
72.849 Internship or Elective	2	72.849 Internship or Elective	2
<i>Spring Quarter</i>			
72.848 Clinical Aspects of Nuclear Medicine	2		
72.849 Internship or Elective	2		

■ Electives

Fall Quarter

12.841 Inorganic Chemistry I	2
12.861 Advanced Organic Chemistry I	2
18.842 Vertebrate Endocrinology	2
72.834 Advanced Clinical Chemistry I	2
72.863 Advanced Medicinal Chemistry III (Anti-infectives)	2
72.865 Special Topics in Medicinal Chemistry	2
73.814 Concepts in Pharmacology	2
87.810 Function of Human Systems	2

Spring Quarter

12.846 Coordination Chemistry	2
12.866 Spectrometric Identification of Compounds	2
18.840 Osmotic and Ionic Regulation	2
18.843 Environmental Physiology	3
72.864 Advanced Medicinal Chemistry IV	2
73.817 Concepts in Toxicology II	2
73.820 Environmental Toxicology	2
73.822 Pathology	2
87.812 Pathophysiology II	2
87.833 Immunobiology	2
90.823 Biochemistry III	2

Winter Quarter

12.842 Inorganic Chemistry II	2
12.862 Advanced Organic Chemistry II	2
18.245 Serology-Immunology	3
18.835 Mammalian Physiology	4
72.835 Advanced Clinical Chemistry II	2
73.816 Concepts in Toxicology I	2
73.844 Drug Metabolism	2
87.811 Pathophysiology I	2
90.822 Biochemistry II	2

Summer Quarter

72.867 Medicinal Chemistry Seminar	2
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Doctor of Philosophy Degree Program in Biomedical Sciences

■ Objectives

The Ph.D. program in Biomedical Sciences helps to consolidate and organize currently ongoing master's degree programs in the College in the areas of clinical chemistry, hospital pharmacy, medical laboratory science, medicinal chemistry, pharmacology, toxicology, and radiopharmaceutical science. The program is designed especially for students who wish to specialize in these areas. All programs and personnel are located in the Mugar Building and share a close relationship between courses, facilities, and research projects.

An important objective of the doctoral program is to confirm and organize an interdisciplinary program that, to some extent, already exists. The program provides an opportunity for students to prepare for and educate themselves to work in overlapping disciplines central to their own areas of interest. A core curriculum, taken by all students in the program, includes basic science courses offered by several colleges of the University as well as by the College of Pharmacy and Allied Health Professions. The core curriculum provides much of the course work on which a student may build a more sophisticated specialization within the major field while also offering the basic educational tools needed to carry out research. The program itself benefits from having students involved in disciplines peripheral to their own and fosters both intra- and interdisciplinary cooperation in research and teaching.

Sample Program

Doctor of Philosophy in Biomedical Sciences

Required Courses

A minimum of twenty-four quarter hours must be taken from the following:

*Biomedical Science Colloquium
Biochemistry I, II, III
Pathophysiology I, II
Concepts in Toxicology I

Functions of the Human System
Advanced Organic Chemistry I, II
Biostatistics

Drug Metabolism
Concepts in Pharmacology I
Genetics

A minimum of sixteen quarter hours must be taken from one of the following areas of specialization. Students may select courses not included in their major area with the approval of the Graduate Committee.

Specialization in Pharmacology

Required
Pharmacological Basis of Ther. I, II
Pharmacologic Methods I, II
Introduction to Biopharmaceutics & Pharmacokinetics
Concepts in Toxicology I
Seminar

Electives

Concepts in Toxicology II
Special Topics in Pharmacology
Receptor Pharmacology
Drug Dependence
Advanced Medicinal Chemistry I-IV
Environmental Toxicology
Radioisotopes in Biological Systems
Immunobiology
Procedures in Endocrinology

Specialization in Pharmaceutical Sciences

- a. *Radiopharmaceutical Science*
Radiation Physics
Nuclear Medicine I-IV
Dosimetry and Health Physics
Clinical Aspects of Nuclear Medicine
Seminar and Research Report
- b. *Biopharmaceutics*
Biopharmaceutics and Pharmacokinetics
Clinical Pharmacokinetics
Radioisotopes in Biological Systems
Seminar

Specialization in Medical Laboratory Science

Hematology I-III
Cellular Pathology I, II
Immunobiology
Analytical Separations I
Advanced Clinical Chemistry I, II
Seminar I-III
Medical Laboratory Management I, II
Modern Methods of Analysis
Adv. Clinical Microbiology I-III

Specialization in Medicinal Chemistry

Special Topics in Medicinal Chemistry
Phytochemistry
Physical Organic Chemistry
Stereochemistry I
Spectrometric Identification of Organic Compounds
Seminar
Advanced Drug Synthesis
Advanced Medicinal Chemistry I-IV
Ident. of Organic Compounds
Isolation and Ident. of Organic Compounds
Organic Reaction Mech. and Organic Synthesis I, II

* Although only two credits are given for this course, students are required to register for it each quarter.

Specialization in Toxicology*Required*

Modern Methods of Analysis
 Concepts in Toxicology I, II
 Environmental Toxicology
 Seminar in Toxicology
 Toxicology Laboratory

Electives

Air Pollution
 Industrial Hygiene
 Air Sampling Analysis
 Air Pollution Science
 Radiation Physics
 Radiobiology
 Analytical Separations
 Spectrometric Identification of
 Organic Compounds
 Identification of Organic Compounds
 Embryology
 Animal Histology
 Dynamics of Aquatic Ecology I, II
 Ecology of Rocky Shores
 Ecology of Salt Marshes
 Human Ecology
 Marine Algae
 Environmental Law
 Biological Electron Microscopy
 Neurochemistry and Behavior
 Environmental and Energy Policy
 Special Topics in Hospital Pharmacy -
 Ethical Aspects of Drug Research
 Advanced Clinical Chemistry I
 Radioisotopes in Biological Systems
 Advanced Medicinal Chemistry I
 (CNS Depressants)
 Advanced Medicinal Chemistry II
 (Autonomic Drugs)
 Advanced Medicinal Chemistry III
 (Anti-infectives)
 Advanced Medicinal Chemistry IV
 (Cancer Chemotherapy)
 Special Topics in Medicinal Chemistry
 Receptor Pharmacology
 Pharmacology of Drug Dependence
 Immunobiology
 Epidemiology
 Cellular Pathology I
 Cellular Pathology II
 Applications of Mass Spectrometry

In addition to the course work, students are required to complete four quarter hours of literature review and a minimum of 16 quarter hours of thesis research, i.e., 72.904 Ph.D. Dissertation for three terms; thereafter, students must register for 72.905 Dissertation Continuation.

Full-Time Doctor of Pharmacy Degree Programs

■ General Information

The Doctor of Pharmacy (Pharm.D.) program is designed to offer an academic program and patient-service experience for selected baccalaureate graduate pharmacists whose abilities and career aspirations suggest significant promise for innovative contributions to professional practice.

Over the past decade, the term “clinical pharmacist” has become synonymous with the Pharm.D. degree. Clinical pharmacy practice is the application of the pharmaceutical sciences on behalf of the patient, considering the patient’s medical status and need to understand drug therapy. This implies a close association between the clinical pharmacist and the patient, physician, and others providing health care service.

Pharm.D. graduates may practice in a wide variety of settings. The most common practice site is the hospital, where clinical pharmacists “round” with physicians and other health practitioners, monitor drug therapy regimens of patients for appropriateness and side effects, provide drug information to physicians and nurses, take medication histories, give discharge medication consultations, and teach rational therapeutics to students of the various health professions. These clinical pharmacists may be employed by the hospital directly or by colleges of pharmacy.

Clinical pharmacists provide drug dosing regimen assistance to physicians through the use of clinical pharmacokinetic principles. They may participate in drug surveillance programs, clinical drug studies, and in adverse drug-reaction reporting programs. Pharm.D. graduates may serve as directors of regional drug information and poison control centers. In some ambulatory settings they provide primary health care services to patients with chronic, pharmacologically-managed disease states such as hypertension, tuberculosis, and diabetes. They are also involved in specialty clinics (i.e., psychiatry, pain, anticoagulation) to assist physicians and patients in maximizing drug therapy.

■ Curriculum

The Doctor of Pharmacy (Pharm.D.) program consists of an intensive two-year, full-time curriculum of didactic coursework, clinical experiences, and an investigational project. Students must earn a minimum of sixty-six credits to complete the program.

The requirements for the first year include coursework in Principles of Medicine, Pharmacotherapeutics, Clinical Pharmacokinetics, Biostatistics, Drug Literature Evaluation, Introductory Clerkship, and Patient Assessment.

Selection and sequencing of these courses enables students to apply their knowledge of drugs and disease aspects to patient monitoring during the clinical clerkships offered in the second year.

In addition to the required clerkships, elective rotations and courses are available. Using the scientific method, Pharm.D. students must also

identify, design, and complete an investigational project pertinent to clinical pharmacy practice.

Students interested in pursuing residency training after completing the Pharm.D. program are eligible for consideration for residency positions by Tufts-New England Medical Center and Massachusetts General Hospital. These residency programs are accredited by the American Society of Hospital Pharmacists (ASHP).

■ Facilities and Hospital Affiliations

Northeastern University is closely affiliated with numerous teaching hospitals and clinics in the Boston area that are associated with the Harvard, Tufts, and Boston University Schools of Medicine. These hospitals and clinics include Massachusetts General Hospital, Tufts-New England Medical Center, Boston Veterans Administration Medical Center, Carney Hospital, Boston Veterans Administration Outpatient Clinic, and Newton-Wellesley Hospital.

Northeastern University provides a University-based Drug Information Service with complete computer access and a pharmacokinetic research laboratory as support services to the clinical pharmacy program.

■ Admission

Applicants must be graduates of baccalaureate programs in pharmacy that are accredited by the American Council on Pharmaceutical Education (ACPE) and must have achieved good academic standing.

Applicants will be evaluated on the basis of their undergraduate record, letters of recommendation, and a personal interview.

The application for admission and all required supporting documents must be received by February 1 of the year in which admission is sought. Applicants are urged to file early.

The Director of Clinical Pharmacy Programs serves as the Chairman of the Pharm.D. Admissions and Academic Standing Committee, which evaluates applicants to the program and advises the Graduate Committee of their suitability for admission. All full-time clinical pharmacy faculty of the College serve as members of this committee.

■ Academic Requirements

To qualify for the Doctor of Pharmacy degree, students must complete the required sixty-six quarter hours of credit and attain a final quality-point average of at least 3.0. The required Principles of Medicine sequence (71.880, 71.881, 71.882) is graded pass/fail, and although the grades earned in this sequence do not count in the calculation of the quality-point average, students must pass all designated sections of this course sequence to meet the requirements for the degree.

The student's academic record is reviewed after each quarter by the program's Admissions and Academic Standing Committee. Students who fail to achieve at least a 3.0 quarterly quality-point average or who

receive an F grade are placed on probation and may be dismissed from the program.

Students are expected to complete successfully all courses and course sections in the time sequence outlined in the curriculum over the two-year period. In special circumstances, the Admissions and Academic Standing Committee may allow deviations from this normal progress—for example, by permitting makeup examinations or the repetition of certain courses or course material.

■ Investigational Component

Students are required to complete an independent investigational project within the domain of clinical pharmacy. The primary objective of this component of the Pharm.D. program is to introduce the student to the use of the scientific method. Students must thus demonstrate the ability to identify a problem, formulate a hypothesis, develop methods to collect and interpret the data to test the hypothesis, and report the investigation in writing using a thesis format. The final thesis must be written in the format described in “Rationale and Instructions for the Preparation of a Thesis,” available in the Graduate School office.

Full-time clinical faculty members serve as the major advisers. Adjunct clinical faculty or other faculty within the College may serve as co-advisers.

The following procedure is in effect for this component:

Quarter II (Fall—first year)

- a Clinical faculty have projects in mind and present ideas to students early in the program.
- b Student selects adviser and project and begins to develop project protocol.
- c Biostatistics and Drug Literature Evaluation must be completed.

Quarter III (Winter—first year)

- a Student and adviser develop protocol, including short introduction to the problem, hypothesis, methodology of study, evaluation parameters, and a short supporting bibliography (protocol length 5-10 pages).
- b Protocol distributed to all clinical faculty and other interested faculty.
- c Protocol defended before entire clinical faculty and other interested faculty to enhance quality of project.
- d Clinical faculty approves project.
- e Student and adviser select research committee, including at least four members, at least one of whom must be outside the Department of Clinical Pharmacy.

Quarter IV (Spring—first year)

- a Student completes literature review and write-up of Introduction and Methodology sections of thesis (approved by adviser and research committee).

Quarter V (Summer—second year)

- a Student begins data collection.

Quarters VI, VII, VIII (Fall, Winter, Spring—second year)

- a Student completes data collection.
- b Student writes up Results, Discussion, and Conclusion sections of thesis (approved by adviser and research committee).

Quarter VIII (Spring—second year)

- a Student completes oral defense (examination) of project before adviser and research committee (see below).
- b Thesis copied and bound. (The final thesis should be written, defended, and signed no later than two weeks before the University commencement deadline.)

Students not completing the thesis by September 30 of their second year in the program must enroll in course 71.899 Clerkship each quarter until the project is completed and satisfactorily defended before the adviser and research committee.

■ Oral Examination

At the completion of the investigational project (usually Quarter VIII), each candidate for the Pharm.D. degree takes a final oral examination, administered by the student's research committee. This examination covers the subject matter of the student's Pharm.D. investigation, significant developments in the field of the investigation, and the student's general background knowledge in clinical pharmacotherapeutics.

Sample Programs

Doctor of Pharmacy

■ Year 1

<i>Summer Quarter</i>	<i>Credits</i>	<i>Fall Quarter</i>	<i>Credits</i>
10.8H3 Biostatistics	2	71.880 Principles of	
71.883 Drug Literature		Medicine I	6
Evaluation	2	71.884 Pharmacokinetics I	2
<i>Winter Quarter</i>		<i>Spring Quarter</i>	
71.881 Principles of		71.882 Principles of	
Medicine II	6	Medicine III	6
71.885 Pharmacotherapeutics II	2	71.886 Pharmacotherapeutics III	2
71.890 Introductory Clerkship I	1	71.894 Pharmacokinetics in	
		Drug Therapy	3

■ Year 2

<i>Summer Quarter</i>		<i>Fall Quarter</i>	
71.892 Patient Assessment	2	71.896 Clerkship II	5
71.893 Psycho-Social Aspects		71.995 Investigational	
of Health Care Seminar	2	Project II	2
71.895 Clerkship I	4	* Administrative Course	
71.994 Investigational		or Elective	(2)
Project I	2		
<i>Winter Quarter</i>		<i>Spring Quarter</i>	
71.897 Clerkship III	5	71.898 Clerkship IV	5
71.890 Seminar I	1	71.981 Seminar II	1
* Administrative Course		* Elective	(2)
or Elective	(2)		

* Students must take an administrative course (71.844 or 71.852 or another administrative course approved by the program's Admissions and Academic Standing Committee) and one elective (two credits) sometime during Quarter VI, VII, and VIII (total of four credits). Elective selections must also be approved by the Admissions and Academic Standing Committee.

Interdisciplinary Doctor of Philosophy Program in Forensic Chemistry

■ Objectives

Offered in conjunction with the College of Criminal Justice and the Institute of Chemical Analysis, Applications, and Forensic Science in the College of Arts and Sciences, the interdisciplinary Ph.D. program in Forensic Chemistry is designed to provide students an opportunity to prepare for research and leadership positions in forensic laboratories. The Graduate School of Pharmacy and Allied Health Professions is the registering department for specialization in forensic toxicology. Two other specializations—forensic analytical chemistry and forensic materials science—are administered by the Chemistry Department in conjunction with the College of Criminal Justice. Admission is made through the registering department.

For students entering with a B.S., completion of the M.S. course requirements in Forensic Chemistry with a 3.0 average is required to qualify for further Ph.D. study. For students with M.S. degrees in forensic science or the natural sciences, individual programs are planned according to the student's background. The course of study includes comprehensive examinations; thesis research to be carried out at the Institute of Chemical Analysis, Applications, and Forensic Science; and a recommended internship at a major forensic laboratory engaged in research.

Description of Courses

- 5.800 See Graduate School of Engineering Catalog.
- 10.8H3 Biostatistics (2 q.h.)
Methods of statistical inference with applications to biology and the medical sciences. *Prof. Stubbs*
Yearly, Fall, Spring, Summer Quarters
- 11.871 Radiation Physics (2 q.h.)
An introduction to the nucleus and modes of spontaneous radioactive transformation. The isotopic abundance of the elements, naturally occurring radioelements and decay series, the kinetics of decay and the relationship between mass and energy. The nature of the emitted radiation and its interaction with matter. *Prep. undergraduate physics.*
Yearly, Winter Quarter
- 11.872 Radiobiology (2 q.h.)
The biological effects of ionizing radiation. Included are a discussion of elementary target theory, radiation chemistry, effects on macromolecules, cellular and chromosomal effects, recovery processes, and the acute and long-term effects of radiation with emphasis on humans, as well as a discussion of environmental sources of radiation and the characteristics of internal and external human exposure. *Prep. 11.871*
Yearly, Spring Quarter
- 12.500 See University College Catalog.
- 12.800 See Graduate School of Arts and Sciences Catalog.
- 12.810 Modern Methods of Analysis (3 q.h.)
Training in a wide variety of modern methods of instrumental analysis with extensive "hands-on" experience provided by a laboratory section. Areas covered include: data handling; spectroscopy (UV-visible and IR absorption, luminescence, X-ray, atomic absorption, and mass spectrometry); separations (gas and modern liquid chromatography, TLC); pulse polarography; X-ray diffraction; microscopy (optical and scanning electron microscopy including X-ray fluorescence microanalysis); computerized instrumentation.
Yearly, Fall Quarter
- 12.821 Analytical Separations (2 q.h.)
Theory and practice of analytical separation techniques. Emphasis on fundamentals as they relate to practice. Topics based mainly on chromatographic processes, including gas and high-speed liquid chromatography. Other topics include: zone refining; liquid extraction; and electrophoresis.
Yearly, Spring Quarter

- **12.822 Electroanalytical Chemistry I** (2 q.h.)
The theory, applications, and instrumentation for potentiometry, pH, ion selective electrodes, conductivity and high-frequency measurements. The techniques of direct measurement, titration endpoint detection, and on-line measurements. Yearly, Winter Quarter
- **12.824, 12.825, 12.826 Special Topics in Analytical Chemistry I, II, III** (2 q.h.)
Selected topics of current importance in analytical chemistry. Fall, Winter, and Spring Quarters
- **12.829 Computers in Chemistry** (3 q.h.)
A laboratory-lecture course focusing on the use of small digital computers for real-time control of chemical instruments. Topics include digital logic, real-time data structures, A/D and D/A conversion, and noise and other aspects of real-time computer interfacing. Programming will be done on a PDP-11 computer in MIRACL, a language designed for real-time processing. *Prep. consent of instructor.*
- **12.861, 12.862 Advanced Organic Chemistry I, II** (2 q.h.)
An intensive survey of organic reactions. Modern concepts of structure and mechanism are used to correlate factual material. *Prep. one year of Organic Chemistry.* Yearly, Fall and Winter Quarters
- **12.863 Physical Organic Chemistry** (2 q.h.)
Topics in basic physical organic chemistry: molecular polarity; equilibrium in kinetics; reactivity and structure; solvent effects; acid base catalysis; orbital symmetry; aromaticity; and related subjects. *Prep. 12.862 or consent of instructor.* Yearly, Spring Quarter
- **12.864, 12.865 Organic Stereochemistry and Reaction Mechanisms I, II** (2 q.h.)
Relations of the stereochemistry of organic molecules to their physical and chemical behavior. Conformational analysis. The effects of spatial relationships on transition states, and equilibria and reaction rates as an introduction to the study of organic reaction mechanisms. *Prep. 12.863.* Yearly, Fall and Winter Quarters
- **12.866 Spectrometric Identification of Organic Compounds** (2 q.h.)
Interpretation of the ultraviolet, infrared, nuclear magnetic resonance spectra of organic compounds. *Prep. one year of Organic Chemistry.* Yearly, Spring Quarter
- **12.876, 12.877 Organic Reaction Mechanisms and Organic Synthesis I, II** (2 q.h.)
The fundamental factors influencing the courses of organic reactions. Substitution reactions. Pericyclic reactions. Synthetic methods as an introduction to organic synthesis. *Prep. 12.865 or concurrent registration therein.* Yearly, Winter and Spring Quarters
- **12.953 Identification of Organic Compounds** (3 q.h.)
Qualitative analysis of organic compounds in mixtures, using physical, chemical, and instrumental methods. Corresponds to Chemistry 12.253. Yearly, Spring Quarter
- **18.200** See Undergraduate Catalog.
- **18.240 Microbial Physiology** (4 q.h.)
The biochemical changes brought about through microbial activities; measurement of metabolic biosynthesis and degradation; rates of reaction; and determination of end products. *Prep. 18.220.* Yearly, Fall and Winter Quarters
- **18.800** See Graduate School of Arts and Sciences Catalog.
- **19.800** See Graduate School of Arts and Sciences Catalog.
- **21.800** See Graduate School of Arts and Sciences Catalog.

- 39.900 See Graduate School of Arts and Sciences Catalog.

- 41.800 See Graduate School of Business Administration Catalog.

- 45.800 See Graduate School of Business Administration Catalog.

- 45.815, 45.816 Behavioral Concepts and Organizational Behavior I (6 q.h.)

Major concepts and findings of the behavioral sciences with particular pertinence to business and administration, including systematic ways of understanding behavior. Specific topics include human development and motivation, interpersonal perception and communication, and small groups processes. The second half of the course sequence relates these basic concepts to specific aspects of behavior in formally constituted organizations. Supervisory behavior is examined in the behavioral context, as well as in relations between groups, in efforts to develop ways of achieving collaboration. *Prep. permission from the Graduate School of Pharmacy and Allied Health Professions.* Yearly, Fall Quarter

- 49.932 Introduction to Computer Applications (3 q.h.)

A business-oriented introduction to data processing functions and systems. Introduction to the history, terminology, technology, and economics of data management issues in the design, selection, evaluation, and use of computers and computer services. Individual familiarization with elementary computer programming by using either batch or time-shared computer facilities to solve simple business-oriented exercises. When feasible, a visit to a data processing center is conducted. *Prep. permission from the Graduate School of Pharmacy and Allied Health Professions.* Yearly, Winter Quarter

- 50.800 See Graduate School of Education Catalog.

- 71.106 Introduction to Biopharmaceutics and Pharmacokinetics (2 q.h.)

An undergraduate course designed primarily to allow students to remedy deficiencies in biopharmaceutics and pharmacokinetics. Factors affecting drug availability from various dosage forms, including bioavailability and bioequivalence of drug products. A quantitative treatment of drug absorption, distribution, metabolism, and excretion, as well as the development of mathematical models for those processes, are also considered. *Prep. permission of instructor. Staff* Yearly, Fall Quarter

- 71.816 Clinical Pharmacokinetics (2 q.h.)

Emphasis is placed upon applying various pharmacokinetic techniques to estimating dosage regimens, evaluating drug therapy, consulting on drug selection, and assessing bioavailability and bioequivalence data. *Prep. a background in biopharmaceutics or consent of instructor. Staff* Yearly, Spring Quarter

- 71.817 Pharmacokinetics (2 q.h.)

Covers methods used to kinetically analyze the absorption, distribution, and elimination of drugs by biological systems. Compartmental models are dealt with primarily, and the theory of compartmental modeling is developed to permit the solution of moderately sophisticated pharmacokinetic models. The practical aspects of experimental design and analysis are emphasized. *Prep. graduate standing and permission of instructor. Staff* Yearly, Fall Quarter

- 71.822 Seminar on Hospital Pharmacy (2 q.h.)

Seminar on current developments or specific problems in hospital pharmacy that have been studied in depth by students with guidance from the graduate faculty. The student presentations may be alternated with guest speakers on topics of current interest. Student participation in the discussions is an essential objective of the course. *Prep. admission to hospital pharmacy program. Prof. Taubman* Yearly, Fall Quarter

- 71.823 Legal Aspects/Federal Legislation in Pharmacy (2 q.h.)

An analysis of the federal and state laws relating to the distribution of drugs in the institu-

tion. Included are common-law liabilities such as malpractice and other frequently encountered problems. *Prep. admission to hospital pharmacy program. Prof. Goldstein*
Yearly, Fall Quarter

■ **71.847 Hospital Pharmacy Administration I (3 q.h.)**

An overview of hospital pharmacy services and an introduction to areas of the hospital that either require or relate to pharmacy services. Inventory, purchasing, and pricing are analyzed both qualitatively and quantitatively. The administrative aspects of materials management, ambulatory care, pharmacy and therapeutics committee, investigational drugs, and pharmacy laws are explored. *Prep. 45.815, 45.816. Profs. Webb, Gouveia.*

Yearly, Winter Quarter

■ **71.848 Hospital Pharmacy Administration II (3 q.h.)**

Management of a department's personnel and financial resources. Management skills, development of new departmental program, personnel administration and organization are covered, as well as budget preparation, analysis and control, and hospital reimbursement. *Prep. 71.847. Profs. Gouveia, Webb.*

Yearly, Spring Quarter

■ **71.849 Computer Applications in Hospital Pharmacy (3 q.h.)**

An extensive review of past, present, and future applications of data-processing systems to institutional pharmacy. Systems design, evaluation, and proposal development to administrators are discussed with emphasis on the interface between the pharmacy staff, computer systems, and the hospital drug distribution process. *Prep. 49.932. Prof. Gouveia*

Yearly, Spring Quarter

■ **71.850 Health Care Administration I (3 q.h.)**

The socioeconomics and statistics of health care, including governmental programs, legislative trends, third-party insurance and welfare programs, and other areas that may affect the management of the modern institutional pharmacy. *Prep. admission to the hospital pharmacy program or consent of instructor. Prof. Goldstein*

Alternate Years, Spring Quarter

■ **71.854 Clinical Pharmacy (2 q.h.)**

The patient-oriented aspects of the application of therapeutic agents to hospital patients. An in-depth study of the relation of therapeutic regimens to laboratory tests and drug interactions. The role of the hospital pharmacist as an active member of the health-care team dealing directly with inpatients and outpatients. *Prep. admission to hospital pharmacy program or consent of instructor. Prof. Scheife*

Yearly, Fall Quarter

■ **71.855 Human Relations in Health Care (2 q.h.)**

A study of personnel psychology, organizational structure, wage and performance incentives, employee evaluations, and policy in relation to accepted personnel concepts and procedures. *Prep. admission to hospital pharmacy program or consent of instructor. Mr. Smith*

Yearly, Spring Quarter

■ **71.858 Contemporary Therapeutics I (2 q.h.)**

Recent developments in current therapeutic approaches and their rationale in the treatment of cardiovascular, neurological, gastrointestinal, musculoskeletal, and metabolic diseases of a noninfectious nature. Therapy related to aging and selected genetic diseases. *Prep. 71.854. Prof. Scheife*

Alternate Years, Winter Quarter

■ **71.859 Contemporary Therapeutics II (2 q.h.)**

Current concepts of infectious diseases and the rationale for the chemotherapeutic treatment of these conditions. Diseases of the blood and blood-forming organs, neoplastic disease, and diseases related to deficiency states. *Prep. 71.854. Prof. Scheife*

Alternate Years, Spring Quarter

■ **71.860 Drug Monitoring (2 q.h.)**

The process by which drugs are monitored to determine their effectiveness, safety, preven-

tion of iatrogenic factors, drug-drug interactions, and matters affecting patient compliance with a therapeutic regimen. The utilization of this information in improving patient care. *Prep. 71.854. Prof. Weiner* Yearly, Spring Quarter

- **71.861 Sterile Products (2 q.h.)**
Theory, principles, methods, and techniques in preparing sterile, pyrogen- and particulate-free products. Equipment and laboratory design required for manufacturing different types of sterile products and the practical considerations essential for their production. *Prep. Permission of instructor. Prof. Janousek* Yearly, All Quarters
- **71.870 Special Topics in Hospital Pharmacy (2 q.h.)**
Selected topics of interest to pharmacy or the health community in general. *Prof. Barnard* Alternate Years, Winter Quarter
- **71.880, 71.881, 71.882 Principles of Medicine I, II, III (6 q.h. each)**
An intensive, three-academic-quarter, organ-system based sequence encompassing anatomy, physiology, pathophysiology, and therapy of disease. (This course is the major component of the second-year curriculum of the Tufts School of Medicine and meets for approximately eighteen hours/week). *Prep. admission to Pharm. D. program. Tufts School of Medicine Staff* Yearly, Fall, Winter, Spring Quarters
- **71.883 Drug Literature Evaluation (2 q.h.)**
Principles and practice of drug information, literature retrieval, and evaluation of the pharmacy and medical literature. *Prep. admission to Pharm.D. program. Prof. Schneiweiss* Yearly, Fall Quarter
- **71.884, 71.885, and 71.886 Pharmacotherapeutics I, II, III (2 q.h. each)**
A three-quarter sequence in advanced contemporary therapeutics of disease. Topics parallel material presented in Principles of Medicine sequence. *Prep. admission to Pharm.D. program. Clinical Pharmacy Staff* Yearly, Fall, Winter, Spring Quarters
- **71.890 Introductory Clerkship I (1 q.h.)**
Initial assignment to clinical site. Student rotates through the various clinical laboratories to obtain working knowledge of the role of the clinical laboratory and the data it generates in the management of disease. Emphasis in microbiology, clinical chemistry and hematology areas. Meets approximately four hours/week. *Prep. admission to Pharm. D. program. Prof. Matthews* Yearly, Winter Quarter
- **71.892 Patient Assessment (2 q.h.)**
General principles of history taking and physical examination. Emphasis is on organ systems of particular importance to the clinical pharmacist in monitoring drug response. *Prep. admission to Pharm.D. program. Staff* Yearly, Summer Quarter
- **71.893 Psychosocial Aspects of Health Care-Seminar (1 q.h.)**
Psychological and social concerns that determine patient behavior and impact on health care. *Prep. admission to Pharm.D. program. Staff* Yearly, Summer Quarter
- **71.894 Pharmacokinetics in Drug Therapy (3 q.h.)**
The application of basic and practical clinical pharmacokinetic techniques to patient care. Topics parallel material presented in Principles of Medicine sequence. *Prep. admission to Pharm.D. program. Prof. Schumacher* Yearly, Spring Quarter
- **71.895, 71.896, 71.897, 71.898 Clerkship I, II, III, IV (4 q.h., 5 q.h., 5 q.h., 5 q.h.)**
A four-quarter sequence of advanced clinical clerkship rotations in patient care at various affiliated clinical sites. Students participate in "rounding" activities with medical and other health professionals and have the opportunity to provide drug information in the therapeutic decision-making process. The emphasis in these rotations is on helping students develop skills and familiarity with the application of drugs in the clinical setting as well as the usual progression of disease. Rotations include internal medicine, ambulatory care,

pediatrics, psychiatry, and elective experiences. Involves approximately 40 hrs/week. *Prep. admission to Pharm.D. program. Staff* Yearly, Summer, Fall, Winter, and Spring Quarters

- **71.980, 71.981, 71.982 Seminar I, II, III** (1 q.h. each)
 A three-quarter sequence covering topics of relevance to the clinical pharmacy practitioner. Principles of effective communication and teaching are discussed. Students are expected to make oral presentations covering various therapeutic and related subjects as well as the progress of their investigational projects. *Prep. admission to the Pharm.D. program. Staff*
 Yearly, Fall, Winter, Spring Quarters
- **71.904 Hospital Pharmacy Thesis** (2-6 q.h.)
Prep. written permission of instructor. Yearly, All Quarters
- **71.994, 71.995 Investigational Project I, II** (2 q.h.)
 Students have the opportunity to demonstrate their ability to identify a problem within the domain of clinical pharmacy, formulate a hypothesis, develop methods to collect and interpret the data in order to test the hypothesis, and report the investigation in writing using a thesis format. (Note "Investigational Component of Pharm.D. Program.") *Prep. admission to Pharm.D. program. Staff*
 Yearly, Summer and Fall Quarters
- **72.808 Identification and Isolation of Natural Products** (3 q.h.)
 A laboratory course in the identification of various types of plant constituents that have medicinal/pharmaceutical use, and the isolation and characterization of known and/or unknown chemical compounds from selected plant samples. *Prep. at least one year of Organic Chemistry and some background in plant chemistry, e.g., 72.253 or 72.866 or by permission of instructor. Prof. Raffauf* Yearly, Winter and Summer Quarters
- **72.812 Advanced Drug Synthesis** (3 q.h.)
 Application of synthetic and analytical techniques to the formation of new drugs. *Prep. two quarters of Organic Chemistry with laboratory. Prof. Neumeyer*
 Yearly, Winter and Summer Quarters
- **72.815 Nuclear Medicine I: Instrumentation** (2 q.h.)
 An introduction to nuclear detection techniques by both lecture and laboratory demonstration. Various systems are considered, including scintillation, ionization, gas, and solid-state detectors. Basic principles of spectrometry with an emphasis on sodium iodide detectors will be studied. *Prep. 11.871. Prof. Jones and Staff* Alternate Years, Winter Quarter
- **72.816 Nuclear Medicine II: Instrumentation** (2 q.h.)
 A study of the application of nuclear detection techniques in the physical aspects of nuclear medicine. Current clinical instrumentation including gamma cameras and scanners, probes, and whole body counters, as well as future developments such as the solid-state and the multiwire proportional cameras, and positron and tomographic imaging devices. Principles of collimation are studied with each system. The application of computers in nuclear medicine. This course includes both lecture and laboratory demonstration and is a companion course to 72.815. *Prep. 11.871 and 72.815. Prof. Jones*
 Alternate Years, Spring Quarter
- **72.817 Nuclear Medicine III: Radiopharmaceuticals** (2 q.h.)
 A study of the chemical and biological aspects of nuclear medicine. A discussion of the methods of radiopharmaceutical preparation and quality control, the use of the agent in organ imaging and as disease-specific radiotracers. As well as *in vivo* nuclear medicine, *in vitro* tests will be considered, including radioimmunoassay and competitive binding assays. The therapeutic use of radioactive compounds will also be studied. *Prep. 72.815 and 72.816. Prof. Davis*
 Alternate Years, Winter Quarter
- **72.818 Nuclear Medicine IV: Radiopharmaceutical Laboratory** (2 q.h.)
 Demonstrations and discussions of the preparation and quality control of radiopharmaceuticals derived from reactor, accelerator, and generator-produced radionuclides. Assay

techniques for radiochemical, radionuclide, and chemical purity. Regulatory implications in the handling and dispensing of radioactive drugs. This is a companion course to 72.817. *Prep.* 72.817. *Prof.* Hanson Alternate Years, Spring Quarter

- **72.825 Special Topics in Clinical Chemistry (2 q.h.)**
Each year a recent special topic of general interest in clinical chemistry is selected for this course. *Prof.* Giese Yearly, Summer Quarter
- **72.834 Advanced Clinical Chemistry I (2 q.h.)**
Lectures are presented on the most significant articles from current issues of *Clinical Chemistry*, including the analysis of drugs, enzymes, hormones, lipids, metals, metabolites, proteins, receptors, and vitamins; and the application of techniques such as immunoassays and HPLC. Students have the opportunity to acquire an understanding of ongoing developments as well as an ability to read the current literature in this field critically. Methodology in clinical chemistry is discussed primarily, but interpretation is also included. *Prep.* 90.823., or permission of instructor. *Prof.* Giese Yearly, Fall Quarter
- **72.835 Advanced Clinical Chemistry II (2 q.h.)**
A continuation of Clinical Chemistry I. *Prep.* 72.834. *Prof.* Giese Yearly, Winter Quarter
- **72.837, 72.838, 72.839 Seminar and Report in Clinical Chemistry I, II, III (2-6 q.h.)**
Reports and discussions of current journal articles in clinical chemistry. *Prep.* 72.835. *Prof.* Giese Yearly, Spring Quarter
- **72.844 Seminar and Research Report in Radiopharmaceutical Science (2 q.h.)**
This course provides an opportunity for the students to familiarize themselves with literature sources and the latest developments in radiopharmaceutical science. A written and oral presentation will be required in a particular area as evidence of an ability to organize and evaluate published material. *Prep.* 72.816. *Prof.* Jones Yearly, Winter Quarter
- **72.845 Radioisotopes in Biological Systems (2 q.h.)**
Methodology of radioactive nuclides and application of these isotopes to biology and medicine, with special emphasis on their use in clinical analysis. *Prep.* permission of instructor. *Prof.* Davis Alternate Years, Spring Quarter
- **72.847 Dosimetry and Health Physics (2 q.h.)**
Review of radiation units and measures of dose. Emphasis will be on the calculation of absorbed dose to the human body from gamma and beta emitters using MIRD pamphlets. Also discussed will be the health physics aspects of nuclear medicine including radiation protection, shielding design and instrumentation. *Prep.* 72.816. *Prof.* Correia Alternate Years, Fall Quarter
- **72.848 Clinical Aspects of Nuclear Medicine (2 q.h.)**
The current practice of diagnostic nuclear medicine in large medical centers and small community hospitals. The effect of pathology in the distribution of radiopharmaceuticals will be considered on an organ and disease basis and illustrated with actual patient findings. The techniques employed in imaging the various organs and body compartments will be presented. Factors influencing the decision to perform a diagnostic nuclear medicine procedure and the choice of the agent to be employed will be discussed. *Prep.* 72.818. *Staff* Alternate Years, Spring Quarter
- **72.849 Radiopharmacy Internship (2 q.h.)**
Designed as a practical on-site introduction to the use of radiopharmaceutics in the clinical environment, this course offers students an opportunity to participate in various functions of a radiopharmacy, including ordering, preparing, dispensing, and dispersing radio-diagnostics; manufacturing nonroutine agents; maintaining quality control procedures; and keeping records. This course is considered a laboratory course, and arrangements for enrollment are usually made on an individual basis with the site of the radiopharmacy subject to approval by the instructor. Offered during all quarters, registration takes place during the fall quarter only. *Prep.* 72.818. *Prof.* Davis Yearly, All Quarters

- **72.850 Biomedical Science Colloquium (2 q.h.)**
Presentations on current research in biomedical science and related areas. Included will be the theoretical basis of the problem as well as experimental results obtained. *Prep. Ph.D. candidate. Staff* Yearly, Fall, Winter, Spring Quarters

- **72.851 Biomedical Science Colloquium (0 q.h.)**
Prep. 72.850. Staff Yearly, Fall, Winter, Spring Quarters

- **72.861 Advanced Medicinal Chemistry I (CNS Depressants) (2 q.h.)**
Presentation and discussion of the chemistry, structure-activity relationships, and mechanism of action of general anesthetics, hypnotics and sedatives, antiepileptics, analgesics, tranquilizers, and muscle relaxants. A consideration of the mechanics of drug design and methods of modification is undertaken. *Prep. 73.814 or permission of instructor. Prof. Neumeyer* Alternate Years, Spring Quarter

- **72.862 Advanced Medicinal Chemistry II (Autonomic Drugs) (2 q.h.)**
A discussion of drugs acting on the central nervous system, with special emphasis on the action mechanism of the chemical mediators of the peripheral nervous system. The role of the agents affecting this system—adrenergic and cholinergic and reversible and irreversible inhibitors of these systems—is discussed in relation to their chemical structure and biological activity. *Prep. 73.814 or permission of instructor. Prof. Neumeyer* Alternate Years, Winter Quarter

- **72.863 Advanced Medicinal Chemistry III (Anti-infectives) (2 q.h.)**
A study of various chemotherapeutic agents employed in the treatment of infectious diseases. Included are: the sulfonamides, antibiotics, antivirals; antitubercular, antifungal, and antimalarial agents. Special emphasis is on structure-activity relationships, mechanisms of action, and modern research in each area. *Prep. 73.814 or permission of instructor. Prof. Jones* Alternate Years, Fall Quarter

- **72.864 Advanced Medicinal Chemistry IV (Cancer Chemotherapy) (2 q.h.)**
Recent developments in new approaches to both carcinogenesis and to the treatment of cancer are emphasized, including alkylating agents, antimetabolites, hormones, miscellaneous compounds, and combinations of the above with radiation and immunology. Possible mechanisms of carcinogenesis and chemotherapeutic action explored. *Prep. 73.814 or permission of instructor. Prof. Rosowsky* Alternate Years, Spring Quarter

- **72.865 Special Topics in Medicinal Chemistry (2 q.h.)**
A special area of medicinal chemistry, including either steroids, CNS compounds, pharmacodynamic agents or chemotherapeutics; their chemistry and structure. *Prep. 73.814 or permission of instructor. Staff* Alternate Years, Fall Quarter

- **72.866 Phytochemistry (2 q.h.)**
The important classes of chemical compounds produced by plants from the standpoint of their biogenetic origin, detection, isolation, and characterization. Application of these techniques to research in pharmacy, medicine, economics, botany, taxonomy. Introduction to the literature of plant chemistry. *Prep. two quarters of Organic Chemistry and two quarters of Biology. Prof. Raffauf* Alternate Years, Fall Quarter

- **72.867 Medicinal Chemistry Seminar (2 q.h.)**
Reports and discussions involving current journal articles and research in medicinal chemistry. *Prep. 72.861-72.865.* Yearly, Summer Quarter

- **72.870 Radiopharmaceutical Research Report I (2 q.h.)**
A selected research project is undertaken by the student under the direction of a faculty member. *Prep. written permission of instructor. Staff* Yearly, All Quarters

- **72.885 Heterocyclic Drugs in Medicinal Chemistry (2 q.h.)**
The application of the combined principles of medicinal and heterocyclic chemistry to the

synthesis of pharmaceutically useful compounds. The emphasis of the material presented will be upon a critical evaluation of the literature methods and rationale. *Prep. Advanced Organic Chemistry I or permission of instructor. Prof. Hanson*

Alternate Years, Winter Quarter

■ **72.903 Medicinal Chemistry Thesis (2-6 q.h.)**

Prep. written permission of instructor. Staff

Yearly, All Quarters

■ **72.904 Ph.D. Dissertation (0 q.h.)**

Prep. written permission of instructor. Staff

Yearly, All Quarters

■ **72.905 Ph.D. Dissertation Continuation (0 q.h.)**

Prep. three quarters of 72.904.

Yearly, All Quarters

■ **73.814 Concepts in Pharmacology (2 q.h.)**

In-depth coverage of the fundamental principles of pharmacology. The course covers pharmacodynamics, including dose-effect relationships and drug-receptor interactions. Pharmacokinetic concepts, including absorption, distribution, and elimination will be presented as well as common pathways of drug metabolism. Other topics to be discussed include pharmacogenetics, drug resistance, tolerance, and physical dependence. An overview of experimental and clinical drug evaluation in humans will be presented. The course is intended as a necessary prerequisite for succeeding courses in pharmacology and toxicology. *Prep. admission to a graduate department or approval of the instructor. Staff*

Yearly, Fall Quarter

■ **73.816 Concepts in Toxicology I (2 q.h.)**

An overview of toxicology describing the elements of method and approach that identify the science. Special emphasis is placed on the systemic site of action of toxicants. The intent of this part of the course is to help provide answers to two questions: 1) What kinds of injury are produced in specific organs or systems by toxic agents? 2) What are the agents that produce these effects? *Prep. 73.814. Profs. Brown/Shatz*

Yearly, Winter Quarter

■ **73.817 Concepts in Toxicology II (2 q.h.)**

Continuation of Concepts in Toxicology I. *Prep. 73.816.*

Yearly, Spring Quarter

■ **73.818 Special Topics in Pharmacology (2 q.h.)**

An in-depth presentation of current research activity in selected areas of pharmacology. Offered at the discretion of the program. *Prep. 73.814*

Alternate Years, Winter Quarter

■ **73.820 Environmental Toxicology (2 q.h.)**

The problems of toxic disturbances and distortions of our biosphere are discussed. When appropriate, the mechanism of action of toxic agents and the basis of their selectivity will be examined. Toxic agents are grouped by chemical or use characteristics such as pesticides, food additives, metals, social poisons, chemical carcinogens, teratogens, and mutagens. This course will attempt to provide perspective for the nontoxicologist to the application of the results of toxicologic investigation and a better understanding of those chemicals which, in ever-increasing amounts, threaten health, comfort, or quality of life. *Prep. admission to a graduate department or approval of the instructor. Prof. Neumeyer*

Alternate Years, Spring Quarter

■ **73.822 Pathology (2 q.h.)**

The student is introduced to the study of the nature of disease, emphasizing the general mechanisms and pathogenesis. Of paramount importance is the effect of disease on the human body. The language of disease is stressed. Basic principles of disease processes and more common special diseases are extensively covered. A research paper may be assigned at the discretion of the instructor. *Prep. Anatomy and Physiology. Staff*

Yearly, Spring Quarter

- **73.829 Experimental Pharmacology** (2 q.h.)
Prep. 73.814 or consent of instructor. Staff Alternates Years, Spring Quarter
- **73.836 Toxicology Lab** (3 q.h.)
 Companion to the undergraduate course 73.256 Toxicology Lab. In addition to the lab work for 72.256, graduate students are expected to complete special projects assigned by their adviser. *Prep. permission of instructor.* Yearly, Winter and Summer Quarters
- **73.837 Pharmacologic Methods I** (3 q.h.)
 Students carry out experiments in the laboratory of a pharmacology or toxicology faculty member. The experiments serve to demonstrate the techniques utilized in that lab to study a pharmacologic question. *Prep. Ph.D. students only. Staff* Yearly, All Quarters
- **73.838 Pharmacologic Methods II** (3 q.h.)
 Continuation of 73.837. *Prep. 73.837. Staff* Yearly, All Quarters
- **73.844 Drug Metabolism** (2 q.h.)
 Presentation of the current principles and methods for studying the metabolic transformation and physiological disposition of drugs and other chemicals of pharmacological and toxicological interest. The chemistry of Phase I and Phase II reactions from a mechanistic and empirical viewpoint is covered. The role of structure, bonding, molecular configuration, substitution, and related physiochemical factors in the enzymatic reaction is assessed. The effects of enzyme induction and other factors such as species, sex, and age on the extent of metabolism are explored. *Prep. 73.814 or permission of instructor. Staff* Yearly, Winter Quarter
- **73.846 Receptor Pharmacology** (2 q.h.)
 Receptors for drug substances and for endogenous ligands are reviewed in a format that combines lecture presentations and discussion. Considerable emphasis is placed on the evaluation of current literature. The course covers: techniques available to study receptors; various models for receptor-ligand interaction; stereochemical aspects of receptor interactions; receptor-mediated coupling mechanisms; evaluation of several specific receptor systems. *Prep. 87.810, 73.814, 90.821, 90.822, 90.823 or permission of the instructor(s). Profs. Deth/Gay* Alternates Years, Winter Quarter
- **73.847 Pharmacology of Drug Dependence** (2 q.h.)
 An intensive survey of the major drug classes subject to misuse and addiction. Lectures emphasize general concepts of tolerance and dependence, the general pharmacology of prototypes of abused drugs, patterns and consequences of abuse in humans, and recent research advances. Selected research papers are critically examined to stimulate quantitative pharmacologic thinking. *Prep. 73.814. Profs. Boisse/Gay* Alternates Years, Spring Quarter
- **73.870 Pharmacology Seminar** (2 q.h.)
Prep. 73.814. Profs. Deth/Boisse Yearly, Spring Quarter
- **73.871 Research Report in Pharmacology I** (2 q.h.)
 A selected research project is undertaken by the student under the direction of a faculty member. *Prep. 73.814. Staff* Yearly, All Quarters
- **73.872 Research Report in Pharmacology II** (2 q.h.)
 A continuation of 73.871. *Prep. 73.814. Staff* Yearly, All Quarters
- **73.873 Pharmacological Basis of Therapeutics I** (2 q.h.)
 A detailed survey of the chemical and pharmacological basis of the major classes and the following characteristics of a prototype agent from each class: indication; adverse reactions; contraindications; structure-activity relationships; metabolism; mechanism of action; clinically significant. Reading assignments cover animal models relevant to therapeutic screening and/or testing and the appropriate design of clinical trials. *Prep. 73.814. Staff* Alternates Years, Winter Quarter

- **73.874 Pharmacological Basis of Therapeutics II** (2 q.h.)
Continuation of 73.873. *Prep.* 73.873. *Staff* Alternate Years, Spring Quarter
- **73.904 Pharmacology Thesis** (2-6 q.h.)
Prep. written permission from Program Director. Yearly, All Quarters
- **87.810 Functions of the Human Systems** (2 q.h.)
Histology and physiology of respiratory, urogenital, endocrine, nervous, and digestive systems. Lectures supplemented by current research articles and student reports. *Prep.* Biology, Chemistry. *Staff* Yearly, Fall and Winter Quarters
- **87.811 Pathophysiology I** (2 q.h.)
Disease processes as appropriate and inappropriate variants of normal physiological functions. A detailed examination of certain important and illustrative diseases rather than a survey or catalogue of diseases in general. *Prep.* Mammalian physiology; knowledge of biochemistry is helpful. *Prof. Marglin* Yearly, Winter Quarter
- **87.812 Pathophysiology II** (2 q.h.)
A continuation of 87.811 Pathophysiology I. *Prep.* 87.811. *Prof. Marglin* Yearly, Spring Quarter
- **87.816 Principles of Hematology and Coagulation Related to Transfusion** (3 q.h.)
Lectures and laboratory experience dealing with: hemoglobins; iron metabolism; blood formation; blood volume functions of circulating cells; anemias; leukemias and lymphomas; coagulation theories, factors, and disorders. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prep.* 87.202 and permission of the instructor. *Prof. Mitsiu* Yearly, Spring Quarter
- **87.821 Medical Laboratory Management I** (2 q.h.)
This course was developed to provide an opportunity for medical technologists to prepare themselves for managerial responsibilities. Participants are introduced to basic skills and knowledge appropriate to the administration of a medical laboratory rather than specialized functional techniques. The basic objectives of the concentration are: to confront the student with appropriate learning experiences; to increase skills and knowledge in basic disciplines underlying administrative practice; and to develop judgment and skills in problem analysis and decision making in organizations. Major topics to be discussed include: supervision; operations; organizations; productivity; quality control; human behavior; communications; personnel management; and environment. *Prep.* medical laboratory experience or consent of instructor. *Mr. Moy* Yearly, Winter Quarter
- **87.822 Medical Laboratory Management II** (2 q.h.)
A continuation of 87.821 Medical Laboratory Management I. Major topics to be discussed include: accounting; budgeting; purchasing; reimbursement, legalities; marketing; planning; and politics. *Prep.* 87.821 or consent of instructor. *Mr. Moy* Alternate Years, Spring Quarter
- **87.826 Health Science Education I** (2 q.h.)
An overview of various aspects of education in the health-related professions to include: design and use of behavioral objectives; evaluation tools (both clinical and didactic); and a survey of various teaching methods. Current journal literature will supplement lecture material. *Prep.* Health Professions major. *Prof. Barr* Alternate Years, Fall Quarter
- **87.827 Health Science Education II** (2 q.h.)
Various types of learning packages or self-instructional aids are examined. With the aid of lecture material and independent assignment, each student will design and produce a 15-minute autotutorial and will present it to the class for critique. Current journal literature will also be used. *Prep.* 87.826. *Prof. Barr.* Alternate Years, Winter Quarter

■ **87.828 Health Science Education III (2 q.h.)**

Application of learning theory to health science education in teaching didactic and psychomotor skills. Each student will be responsible for presenting one 15-minute unit to the class and for teaching one session of a class to undergraduate students. Each unit will include defining objectives, selecting evaluation tools, and determining the appropriate instructional technique. *Prep.* 87.827. *Prof.* Barr Alternate Years, Spring Quarter

■ **87.832 Hematology I—Disorders of the Erythrocytes (2 q.h.)**

A detailed examination of the physiology and pathology of red blood cells and hemoglobin. *Prep.* Some knowledge of basic hematology is essential, and familiarity with general mammalian biochemistry is strongly recommended. *Prof.* Marglin Alternate Years, Fall Quarter

■ **87.833 Immunobiology (2 q.h.)**

Topics of current interest in immunobiology, such as organ transplantation, immune tolerance, autoimmune diseases, and the immunology of cancer. *Prep.* consent of instructor. *Prof.* Gozzo Yearly, Spring Quarter

■ **87.842 Hematology II—Disorders of the Leukocytes (2 q.h.)**

The pathophysiology of white cell disorders. Clinical and laboratory correlations of leukemias, myeloproliferative and lymphoproliferative disorders, infections, and inherited leukocyte anomalies. *Prep.* undergraduate biochemistry. *Staff* Yearly, Winter Quarter

■ **87.845 Epidemiology (2 q.h.)**

Basic concepts of epidemiology, causes of disease, factors contributed by agents, the human host, and the environment. Acquisition and evaluation of data. Relationship of person, time, and place. Case studies and problems. *Prep.* consent of instructor. *Prof.* Klaas Alternate Years, Winter Quarter

■ **87.852 Hematology III—Coagulation (2 q.h.)**

Clinical and laboratory correlations of coagulation disorders. The use of factor analysis in diagnosis of coagulation disorders. *Prep.* undergraduate biochemistry, hematology course, or experience. *Prof.* Davis Yearly, Spring Quarter

■ **87.855 Principles of Medical Endocrinology (2 q.h.)**

Endocrine-related clinical abnormalities with emphasis placed on the relationship of clinical laboratory measurement to biochemical dysfunctions of the endocrine system. *Prep.* biochemistry. *Prof.* Marglin. Alternate Years, Fall Quarter

■ **87.857 Cellular Pathology I (2 q.h.)**

A survey of the cell and its components, with emphasis on lesions in cellular function and their causes. Examples will be drawn from both prokaryotes and eukaryotes. *Prof.* Rorke Yearly, Winter Quarter

■ **87.858 Cellular Pathology II (2 q.h.)**

Control mechanisms, with emphasis on cancer and other cellular abnormalities. *Prep.* 87.857. *Prof.* Rorke Alternate Years, Spring Quarter

■ **87.861 Advanced Clinical Microbiology I (2 q.h.)**

An introduction to the role of the microbiology laboratory in the clinical practice of infectious disease medicine. Major emphasis is on the interaction between laboratory and physician in the diagnosis and control of the more common infectious disease problems. Specific topics include central nervous system infections, infective endocarditis, bacterial sepsis, infectious diarrheas, respiratory tract infections, urinary tract infections, opportunistic and nosocomial infections, and antimicrobial susceptibility testing. *Prep.* undergraduate course in medical or clinical microbiology or permission of instructor. *Prof.* Klaas Alternate Years, Fall Quarter

■ **87.862 Advanced Clinical Microbiology II (2 q.h.)**

A discussion of the clinical presentation of patients with unusual or rare infectious diseases

and the role of the microbiology laboratory in detecting and identifying the causative agents of these diseases. Major emphasis is on mycotic and rare bacterial diseases including actinomycosis, "atypical" mycobacteriosis, granuloma inguinale, leprosy, leptospirosis, melioidosis, mucormycosis, protothecosis, rat bite fever, and relapsing fever. *Prep.* 87.861 or 87.254 or permission of instructor. *Prof. Klaas* Alternate Years, Winter Quarter

■ **87.863 Advanced Clinical Microbiology III (2 q.h.)**

A continuation of 87.862 with lectures and discussion on unusual parasitic infections, role of the clinical microbiology laboratory in viral diagnosis, antimicrobial agents, and the role of the clinical laboratory in their use; and newer methods for the detection, identification, and susceptibility testing of pathogenic microorganisms. *Prep.* 87.861, or advanced undergraduate course in medical microbiology, or permission of instructor. *Prof. Klaas* Alternate Years, Spring Quarter

■ **87.866 Interpretive Clinical Chemistry (2 q.h.)**

Discussions of variables affecting results to be considered when interpreting patient chemistry values. This knowledge is pertinent to the laboratorian in determining the validity of performing a particular assay on a specimen collected or stored under certain conditions as well as determining the feasibility of obtained results for particular patient conditions. The course also includes the typical value patterns seen in various pathological conditions to provide background material on frequently encountered pathological variation. *Prep.* biochemistry and clinical laboratory experience. *Profs. Hansen and Statland* Alternate Years, Winter Quarter

■ **87.870 Immunohematology Administration (2 q.h.)**

Lectures and experience dealing with standards for blood banks and transfusion services (federal, state, AABB); requirements for state, FDA, and NIH (BOB) licensing; the American Blood Commission; inspection and accreditation donor procurement; interbank blood exchange; organization of blood bank and transfusion service; medical and legal aspects of transfusion practice; design of physical facilities; evaluation, selection and maintenance of equipment; evaluation and selection of supplies and reagents; preparation; labeling requirements; quality control systems; proficiency testing programs; record keeping; computer principles, use of computer facilities; operations of donor facilities and blood bank laboratories. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prep.* 87.253 and permission of instructor. *Prof. Mitsui* Yearly, Fall Quarter

■ **87.871 Immunohematology Administration Laboratory (2 q.h.)**

Laboratory experience dealing with standards for blood banks and transfusion services (federal, state, AABB); requirements for state, FDA, and NIH (BOB) licensing; the American Blood Commission; inspection and accreditation donor procurement; interbank blood exchange; organization of blood bank and transfusion service; medical and legal aspects of transfusion practice; design and physical facilities; evaluation, selection, and maintenance of equipment; evaluation and selection of supplies and reagents; preparation; labeling requirements; quality control systems; proficiency testing programs; record keeping; computer principles, use of computer facilities; operations of donor facilities; and blood bank laboratories. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prep.* 87.253 and permission of instructor. *Prof. Mitsui*

Yearly, Fall Quarter

■ **87.872 Transfusion Therapy (2 q.h.)**

Lectures dealing with selection of blood donors, phlebotomy and pheresis procedures, processing requirements, donor reaction, blood components, physical characteristics of stored blood, indications for transfusion, transfusion reaction, therapeutic phlebotomy and pheresis, autologous transfusions, pediatric transfusions, massive blood replacement, extracorporeal perfusion, cardiopulmonary bypass, and dialysis. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prep.* 87.253 and permission of instructor. *Prof. Mitsui*

Yearly, Fall Quarter

- **87.873 Transfusion Therapy Laboratory (2 q.h.)**
 Laboratory experience with selection of blood donors, phlebotomy and pheresis procedures, processing requirements, donor reaction, blood components, physical characteristics of stored blood, indications for transfusion, transfusion reactions, therapeutic phlebotomy and pheresis, autologous transfusions, cardiopulmonary bypass, and dialysis. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prep. 87.253 and permission of instructor. Profs. Mitsiu and Ghosh*
 Yearly, Fall Quarter
- **87.874 Genetic and Immunologic Aspects of Blood Group Identification (1 q.h.)**
 Lectures dealing with immune response, physical chemistry of immunohematological tests, immunological diseases, tests for detection and identification of antibodies and antigens, principles of human genetics, blood group genetics, and population and family studies. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prep. 87.253 and permission of instructor. Prof. Mitsiu*
 Yearly, Winter Quarter
- **87.875 Genetic and Immunological Aspects of Blood Group Identification Laboratory (1 q.h.)**
 Laboratory experience dealing with immune response, physical chemistry of immunohematological tests, immunological diseases, tests for detection and identification of antibodies and antigens, principles of human genetics, blood group genetics, and population and family studies. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prep. 87.253 and permission of instructor. Prof. Mitsiu*
 Yearly, Winter Quarter
- **87.876 Principles and Foundations of the Blood Group Systems (2 q.h.)**
 Lectures and experience with the human blood group systems, their antigens and antibodies, genetic inheritance and interactions, frequencies, mutants and alterations by disease states, and blood group testing. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prep. 87.874, 87.875 and permission of instructor. Prof. Mitsiu*
 Yearly, Winter Quarter
- **87.877 Principles and Foundations of the Blood Group Systems Laboratory (2 q.h.)**
 Laboratory experiences with the human blood systems, their antigens and antibodies, genetic inheritance and interactions, frequencies, mutants and alterations by disease states, and blood group testing. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prep. 87.874, 87.875 and permission of instructor. Prof. Mitsiu*
 Yearly, Winter Quarter
- **87.878 The Design and Problems of Compatibility Testing (1 q.h.)**
 Lectures and experience with the design and purpose of compatibility testing; factors complicating compatibility procedure; techniques employed in compatibility testing; leukocyte, platelet, and tissue compatibility; and special crossmatch and transfusion procedures. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prep. 87.874, 87.875, 87.876, 87.877 and permission of instructor. Prof. Mitsiu*
 Yearly, Spring Quarter
- **87.879 The Design and Problems of Compatibility Testing Laboratory (2 q.h.)**
 Laboratory experience with the design and purpose of compatibility testing; factors complicating compatibility procedures; techniques employed in compatibility testing; leukocyte, platelet and tissue compatibility; and special crossmatch and transfusion procedures. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prep. 87.874, 87.875, 87.876, 87.877 and permission of instructor. Prof. Mitsiu*
 Yearly, Spring Quarter
- **87.890 Seminar (1 q.h.)**
 Topics to be announced quarterly. *Staff*
 Yearly, Fall, Winter and Spring Quarters

- **87.990 Graduate Research Report I (2 q.h.)**
 Research of a special topic in medical laboratory science, involving individual research, is undertaken and reported under the direction of a faculty member. *Prep. written permission of instructor.* Yearly, All Quarters

- **87.991 Graduate Research Report II (2-4 q.h.)**
 Continuation of 87.990. *Prep. 87.990. Staff* Yearly, All Quarters

- **87.992 MLS Thesis (2-6 q.h.)**
Prep. written permission of instructor. Yearly, All Quarters

- **90.821 Biochemistry I (2 q.h.)**
 Description of the components of biochemistry, including the chemistry of carbohydrates, lipids, prostaglandins, steroid hormones, amino acids, polypeptides, proteins, purines, pyrimidines, nucleosides, and nucleic acids. Consideration of Henderson-Hasselbalch expression, buffers, and importance of pKa. *Prep. two quarters of Organic Chemistry. Prof. Rosowsky* Yearly, Summer and Fall Quarters

- **90.822 Biochemistry II (2 q.h.)**
 Discussion of enzymes, enzyme kinetics, and mechanisms of enzyme reactions. An introduction to the methods used for intermediary metabolism, bioenergetics, biological oxidation-reduction reactions, and the electron transport chain. A consideration is made of carbohydrate metabolism, including the citric acid cycle, the Embden Meyerhoff pathway, and the pentose phosphate pathway. Use of isotopes in biochemistry and the role of high-energy phosphate compounds are outlined. *Prep. 90.821. Staff.* Yearly, Summer and Winter Quarters

- **90.823 Biochemistry III (2 q.h.)**
 Lipid metabolism is presented, including the fatty acid cycle, the biosynthesis of fatty acids, and the biological formation of the prostaglandins, cholesterol, and steroid hormones. The metabolism of the various amino acids is considered, including the urea cycle, one-carbon fragments, transamination reactions, and aromatic hydroxylations. Metabolism of nucleic acids and their building blocks are discussed, as well as the genetic basis of protein synthesis, the genetic code, and the mechanisms of control. *Prep. 90.822.* Yearly, Spring Quarter

- **90.824 Applications of Mass Spectrometry (2 q.h.)**
 A comprehensive examination of the principles governing the fragmentation of organic molecules, the interpretation of mass spectra and discussion of applications of mass spectrometry to the solution of selected problems in the fields of chemistry, biochemistry, and forensic sciences. *Prep. 1 year Organic Chemistry, Basic Physics; Physical Organic Chemistry desirable but not essential. Prof. Costello* Yearly, Summer Quarter

Financial Information

Financial Obligations

■ Tuition

Tuition rates are subject to revision by Northeastern's president and Board of Trustees at any time and may change year by year. For this reason, tuition rates for programs in the College of Pharmacy and Allied Health Professions are provided in a cover letter specific to the year and program about which inquiries are made.

In addition to standard tuition fees, doctoral candidates actively utilizing the resources of the University in their Ph.D. dissertation are charged \$600 per quarter. Those doctoral candidates registered for dissertation work performed off campus are charged \$200 in addition to tuition charges each quarter, and those doctoral candidates who are no longer actively utilizing University resources are charged a continuation fee of \$50 per quarter.

Tuition statements are mailed to students by the Bursar's Office and are payable by check to Northeastern University.

■ Fees

All students are charged an application fee of \$25 when they apply for the first time to a graduate school at Northeastern University. There is an additional \$100 fee charged to new graduate international students, payable upon the date of their acceptance to the University.

Other fees include a charge of \$50 for late payment of tuition and a fee of \$25 for all degree candidates, payable before commencement by the applicable date listed on the academic calendar.

For full-time students there is a charge of \$12.50 per quarter for the services available in the Student Center. For teaching assistants and research fellows, the fee is \$6.25 per quarter. All part-time students on the Huntington Avenue Campus are charged \$.75 per quarter.

All full-time students pay a nonrefundable University Health Services fee of \$220 each year. This fee is waived for full Tuition Scholarship reci-

patients. A separate brochure from the Health Services gives details of the plan. Tuition and fees are subject to change without notice.

Students participating in clinical applied studies must carry the University liability insurance.

All financial obligations to the University must be discharged before graduation.

■ Refunds

Tuition refunds are granted only on the basis of the date appearing on the student's official withdrawal form. (See page 14 for information on withdrawal.) Questions regarding refunds should be directed to the Bursar's Office.

Refunds are granted in accordance with the following schedule:

Official Withdrawal Filed Within:	% of Tuition Refunded
First week of quarter	100
Second week of quarter	75
Third week of quarter	50
Fourth week of quarter	25

Financial Aid

The Office of Financial Aid offers several types of assistance to graduate students. All awards are based on comparative financial need. Because most of these awards are sponsored by the federal government, the amount of aid granted depends upon the amount of funds allocated to Northeastern University each year.

Only students who have been officially accepted as degree candidates are reviewed for financial aid; to meet the financial aid application deadlines, however, students may have to submit their applications before they have been accepted into the Graduate School. In addition, the University awards financial aid only to students who are U.S. citizens or permanent resident aliens in the United States. International students who are studying in the United States on student visas are not eligible for federal assistance.

Northeastern University is a participant in the Graduate and Professional School Financial Aid Service (GAPSFAS). All applicants must file a GAPSFAS form to be considered for financial aid. All sections of the GAPSFAS form, including the parents' information, must be completed and sent to GAPSFAS, Box 2614, Princeton, NJ, 08540. Northeastern University also requires a Graduate School Financial Aid Application and Financial Aid Transcript listing all financial aid received at other postsecondary schools. These forms may be obtained from the Office of Financial Aid, 254 Richards Hall.

The following types of assistance are administered by the Office of Financial Aid:

■ National Direct Student Loan

This program is available to full-time graduate students who *need* a loan to meet their educational costs. Graduate students may borrow up to \$12,000 under this program over their entire educational careers. Repayment and interest do not begin until six months after the student ceases to carry at least a half-time academic load. Repayment may be extended over a ten-year period with an interest rate of 5 percent. No payments are required for up to three years while a borrower is serving in the Armed Forces, the Peace Corps, or VISTA, or is working as a full-time volunteer for a tax-exempt, nonprofit organization.

■ Guaranteed Student Loan Program

Under this program, students whose families have adjusted gross incomes of less than \$30,000 are eligible for a loan if they are enrolled at least half time. Students whose families exceed this income ceiling may be eligible if they can show financial need in accordance with U.S. Department of Education guidelines. Eligible students may borrow up to \$5,000 per year from a participating bank or other financial institution. New federal regulations were signed into law on October 1, 1981.

New borrowers (those who did not have outstanding Guaranteed Student Loans as of January 1, 1981) begin repayment at 9 percent interest six months after they cease enrollment on at least a half-time basis. Borrowers who have outstanding loans under this program at 7 percent interest may continue to borrow at 7 percent. Their loans become due nine months after they cease enrollment on at least a half-time basis. Repayment may be extended for up to ten years. No payments are required while the borrower is serving up to three years in the Armed Forces, Peace Corps, or VISTA, or as a full-time volunteer in other tax-exempt, nonprofit organizations. Information and applications are available from lenders, state guarantee agencies, regional offices of the U.S. Department of Education, and the Office of Financial Aid.

■ College Work Study Program

This program is available to full-time graduate students who have demonstrated financial need. It is designed to give students an opportunity to earn as much as \$5.00 per hour working in jobs on or off campus in public or private nonprofit organizations. This program is administered solely by the Office of Financial Aid and should not be confused with the University's Cooperative Education Program.

All Financial Aid application materials may be obtained from the Office of Financial Aid, 254 Richards Hall.

These brief descriptions of federally funded programs do not purport to fully describe the programs. Further, these programs are subject to changes in funding and scope, as determined by the U.S. Congress and Department of Education. Applicants should secure up-to-date information from the University's Office of Financial Aid.

Scholarships

■ Martin Luther King, Jr., Scholarships

Established in 1969 in memory of the late Rev. Martin Luther King, Jr., awards are made as openings occur to qualified minority graduate students who show financial need and are accepted to full-time study in the graduate schools of the University. Stipends cover tuition and all fees. Applications for Martin Luther King Scholarships are available at the African-American Institute, 40 Leon Street, 617-437-3141.

■ Northeastern University Fellowships (NUF)

These fellowships are designed to assist a limited number of students accepted for full-time study in the graduate schools of the University. The awards are made to students who demonstrate superior academic achievement and are competitive within each graduate school. Stipends cover tuition and fees. Applications may be obtained from the Graduate School office.

Assistantships

The College of Pharmacy and Allied Health Professions offers several forms of assistantship to students enrolled in its Graduate School. Applications for these assistantships may be obtained directly from the Graduate School office.

■ Teaching Assistantships

A limited number of teaching assistantships are available to graduate students, offering them the opportunity to receive a tuition scholarship. A stipend is also given with the award in return for academic assistance in the areas of instruction, laboratory supervision, and proctoring examinations. Assigned duties require approximately twelve hours per week.

■ Graduate Administrative Assistantships

These assistantships provide students the opportunity to receive a tuition scholarship. A stipend is also given with the award in return for the performance of administrative duties in instructional and noninstructional offices. Assigned duties generally require about twelve hours per week.

■ Research Assistantships

Research assistantships also offer students tuition scholarships and a stipend in return for research activities in instructional departments or other University offices or laboratories.

■ Northeastern University Tuition Assistantship

A limited number of tuition assistantships are available, offering remission of tuition to full-time students who assist in the administrative work of a department for approximately ten hours a week. These awards are normally made to graduate students in the first year of graduate work. Students should note that the value of the tuition received via this type of assistantship has been defined by the Internal Revenue Service as taxable income.

■ Residence Hall Staff Positions

A few residence hall staff positions, providing room and board, are available through the Student Housing Office. Further information and application forms may be obtained from the Office of University Housing.

Although no dormitory facilities exist for graduate students, housing information is provided through the Office of University Housing.

■ Physical Examination

All students receiving graduate awards must have a record of a physical examination filed with Health Services. When students receive an award for the first time, information concerning this requirement is sent to them by Health Services.

■ Appointments

Appointments to fellowships and assistantships are ordinarily announced no later than April 15 for the following academic year or summer. Appointments are for a maximum of three academic quarters and are not automatically renewed. Students who hold assistantships and fellowships are expected to devote full time to their studies and the duties of the award. They may not accept outside employment without the consent of their faculty adviser and the Director of the Graduate School.

Acceptance Conditions

As a member of the Council of Graduate Schools of the United States, Northeastern University subscribes to the following resolution of the Council:

Acceptance of an offer of financial aid (such as a graduate scholarship, fellowship, traineeship, or assistantship) for the next academic year by an actual or prospective graduate student completes an agreement that both student and graduate school expect to honor. In those instances in which the student accepts the offer before April 15 and subsequently desires to withdraw, the student may submit in writing a resignation of the appointment at any time through April 15. However, an acceptance given or left in force after April 15 commits the student not to accept

another offer without first obtaining a written release from the institution to which a commitment has been made. Similarly, an offer by an institution after April 15 is conditional on presentation by the student of the written release from any previously accepted offer.

General Information

Central Campus

■ Description

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, the Boston Public Library, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intra-state lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The 50-acre campus is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

■ Ell Student Center

The Carl S. Ell Student Center provides facilities for student recreation and extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

■ Libraries

The University library system consists of the Dodge Library, which is the main library; the Suburban Campus Library at Burlington; the School of Law Library; and divisional libraries for Physics and Electrical Engineering; Chemistry and Biology; Mathematics and Psychology; and Health, Physical and Recreation Education, and Physical Therapy. There are additional subject collections for the Center for Management Development at Andover, Massachusetts, and the Marine Science Institute in Nahant.

The library collections number 500,000 volumes supplemented by some 550,000 titles in microprint, microfilm, and microfiche forms. The collection includes, in addition, some 4,000 periodical titles, 100,000 documents, and 4,600 sound recordings.

■ Cabot Physical Education Center

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. The large gymnasium contains four basketball courts. In addition, the Center consists of an athletic cage and a small gymnasium as well as administrative offices for the Department of Athletics and for the Physical Education Department of Boston-Bouvé College of Human Development Professions.

A recent addition to the center, the Barletta Natatorium, houses a 105-foot swimming pool, a practice tank for the crew, handball and racquetball courts, and shower and dressing facilities.

■ Dockser Hall

Charles and Estelle Dockser Hall, completed in 1968, houses a large gymnasium, dance studio, motor performance laboratory, college library, community recreation laboratory, folk arts center, dark and music rooms, recreation resources area, locker rooms, offices, classrooms, conference room and lounge, storage facilities, and a research laboratory.

Suburban Facilities

■ Suburban Campus

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and noncredit state-of-the-art programs are offered.

■ Warren Center

The Warren Center is located on 165 acres in Ashland, Massachusetts, thirty miles west of Boston. The Center provides an outdoor laboratory for students of physical education and recreation and leisure studies at Northeastern's Boston-Bouvé College of Human Development Professions. However, the Warren Center invites the use of the Center by Northeastern's staff, faculty, alumni, and students, and welcomes other educational groups seeking enrichment in an outdoor setting. The Center offers woods, fields, and a lake as well as tennis courts, an archery range, camp sites, an outdoor pavilion, a lodge that can accommodate up to 150 people in its dining room, heated cabins, a health lodge, and conference accommodations.

■ Henderson House

The University's conference center, Henderson House, is located in Weston, Massachusetts, 12 miles from the main campus. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups.

University Policies

■ Delivery of Services

The University assumes no liability, and hereby expressly negates the same, for failure to provide or delay in providing educational or related services or facilities or for any other failure or delay in performance arising out of or due to causes beyond the reasonable control of the university. These causes include, without limitation, power failure, fire, strikes by University employees or others, damage by the elements, and acts of public authorities. The University will exert reasonable efforts, when in its judgment it is appropriate to do so, to provide comparable or substantially equivalent services, facilities or performance, but its inability or failure to do so shall not subject it to liability.

The Northeastern catalog contains *current information* regarding the University calendar, admissions, degree requirements, fees, and regulations, and such information is not intended to be and should not be relied upon as a statement of the University's contractual undertakings.

Northeastern University reserves the right in its sole judgement to promulgate and change rules and regulations and to make changes of any nature in its program, calendar, admissions policies, procedures and standards, degree requirements, fees, and academic schedule whenever it is deemed necessary or desirable. These changes can include, without limitation, changes in course content, rescheduling of classes, canceling of scheduled classes and other academic activities, and the requiring or affording of alternatives for scheduled classes or other academic ac-

tivities. In any such case, the University will give such notice as is reasonably practicable under the circumstances.

We at Northeastern will do our best to make available to you the finest education we can provide, the most stimulating atmosphere in which to learn, and the most congenial conditions under which you may enjoy the learning experience. But the quality and the rate of progress of your academic career is in large measure dependent upon your own abilities, commitment, and effort. You will be a full participant in an educational partnership. We will and, indeed, can only make the opportunities available to you; it is up to you to take advantage of them.

This is equally true with your career upon graduation. We cannot guarantee that you will obtain any particular job; that will depend upon your own skills, achievement, presentation, and other factors such as market conditions at that time. Similarly, in many professions and occupations there are increasing requirements imposed by federal and state statutes and regulatory agencies for certification or entry into a particular field. These may change during the period of time when you are at Northeastern and they may vary from state to state. While we will be ready to help you find out about these requirements and changes, it is your responsibility to initiate the inquiry because we cannot know what your expectations and understandings are unless you tell us.

In brief, what we are saying to you is that we are here to offer you educational opportunities and choices and to assist you in finding the direction in which you want to steer your educational experience. But you are a partner in this venture with an obligation and responsibility to yourself.

■ Equal Opportunity Policy

Northeastern University is committed to a policy of providing equal opportunity for all. In all matters involving admissions, registration, and all official relationships with students, including evaluation of academic performance, the University insists on a policy of nondiscrimination. Northeastern University is also an equal opportunity employer; it is institutional policy that there shall not be any discrimination against any employee or applicant for employment because of race, color, religion, sex, age, national origin, or on the basis of being a handicapped but otherwise qualified individual. In addition, Northeastern takes affirmative action in the recruitment of students and employees. Inquiries concerning our equal opportunity policies may be referred to the University Affirmative Action Officer, 175 Richards Hall, 617-437-2133. Northeastern's efforts to comply with the Title IX Educational Amendments of 1972 are also coordinated by the Dean and Director of Affirmative Action, 175 Richards Hall.

■ **The Office of Services for the Handicapped**

The Office of Services for the Handicapped (OSH) provides a variety of support services and general assistance to all of Northeastern's disabled students and employees. The University's efforts to comply with the Rehabilitation Act of 1973 are coordinated by Ruth Bork, OSH Director, 5 Ell Center, (617) 437-2675.

■ **Family Educational Rights and Privacy Act**

In accordance with the Family Educational Rights and Privacy Act of 1974, Northeastern University permits its students to inspect their records wherever appropriate and to challenge specific parts of them when they feel it necessary to do so. Specific details of the law as it applies to Northeastern are printed in the *Student Handbook* and are distributed annually at registrations of University College and the graduate schools.

■ **Emergency Closing of the University**

Northeastern University has made arrangements to notify students, faculty, and staff by radio when it becomes necessary to cancel classes because of extremely inclement weather. Radio stations WBZ, WEEI, WHDH, WJDA, WCOZ, WRKO, WLYN, WKOX, WHAV, WBCN, WHUE, WVBF, WRBB, and WLLH will announce the University's decision to close.

Administration and Graduate Faculty College of Pharmacy and Allied Health Professions

Administration

Norman R. Boisse, Director of the M.S. Program in Pharmacology, 211 Mugar Hall, 437-3224 or -4182

Roger W. Giese, Director of the M.S. Program in Clinical Chemistry, 110 Mugar Hall, 437-3227.

William A. Gouveia, Director of the M.S. Program in Hospital Pharmacy, Tufts-New England Medical Center, 956-5380.

James J. Gozzo, Director of the M.S. Program in Medical Laboratory Science, 110 Mugar Hall, 437-3318.

Robert N. Hanson, Director of the M.S. Programs in Medicinal Chemistry and Radiopharmaceutical Science, 211 Mugar Hall, 437-3313.

Carol M. Konis, Administrative Assistant, Graduate School of Pharmacy and Allied Health Professions, 110 Mugar Hall, 437-3211.

John L. Neumeyer, Director of the Graduate School of Pharmacy and Allied Health Professions; Director of the Ph.D. Program in Biomedical Science, 110 Mugar Hall, 437-3206.

Gerald E. Schumacher, Dean of the College of Pharmacy and Allied Health Professions, 205 Mugar Hall, 437-3323.

Larry N. Swanson, Director of the Pharm.D. Program, 113 Mugar Hall, 437-3207.

Full-Time Graduate Faculty

Barbara Ameer, Assistant Professor of Clinical Pharmacy
Pharm.D., Medical College of Virginia
Effects of aging on bioavailability and pharmacokinetics

David Barnard, Assistant Professor of Behavioral Sciences in Health Care
Ph.D., Harvard University
Interpersonal relationships and human values in health care; interdisciplinary studies in psychology and religion

Judith Barr, Associate Professor of Medical Laboratory Science, Associate Dean of the College of Pharmacy and Allied Health Professions
M.Ed., Boston State College; MT (ASCP)
Health professions curriculum design; health policy issues and assessment

Norman R. Boisse, Assistant Professor of Pharmacology and Physiology; Director of M.S. Program in Pharmacology
Ph.D., Cornell University
Neuropharmacology, sedative-hypnotic dependence, and drug abuse

Mehdi Boroujerdi, Assistant Professor of Pharmaceutics
Ph.D., University of North Carolina
Drug metabolism and disposition, biopharmaceutics, and pharmacokinetics

David R. Brown, Associate Professor of Toxicology and Pharmacology; Director of the B.S. Program in Toxicology
Sc.D., Harvard School of Public Health
Toxicologic effects on developing nervous systems; biochemical modes of toxicity; environmental toxicology

Robert J. Cersosimo, Assistant Professor of Clinical Pharmacy
Pharm.D., University of Utah
Clinical oncology; application of antineoplastic agents

Gerald L. Davis, Associate Professor of Medical Laboratory Science
Ph.D., University of California at Davis, MT (ASCP)
Physiological changes in hemostasis; effects of aging, exercise, and high altitude

Richard C. Deth, Associate Professor of Pharmacology; Director of the B.S. Program in Pharmacy
Ph.D., University of Miami
Receptor-mediated activation of vascular smooth muscles, Ca^{2+} in excitable membranes; NaK ATPase in vascular smooth muscle

Michael H. Gay, Instructor in Pharmacology
Ph.D., Washington University
Regional specificity of drug action in the central nervous system and tolerance-dependence phenomena

Roger W. Giese, Professor of Clinical Chemistry; Director of the M.S. Program in Clinical Chemistry
Ph.D., Massachusetts Institute of Technology
Application of organic, chromatographic, and immunochemical methodology to ultratrace clinical analysis

Arnold S. Goldstein, Professor of Pharmacy Administration
J.D., New England School of Law, L.L.M., Suffolk University
Pharmacy Law

Donna Goolkasian, Assistant Professor of Clinical Pharmacy
Pharm.D., State University of New York at Buffalo
Pharmacotherapeutics and clinical use of drugs in patient care

James J. Gozzo, Professor of Health Science; Director of the M.S. Program in Medical Laboratory Science
Ph.D., Boston College
Cancer and transplantation immunology

Jessie L. Hansen, Assistant Professor of Medical Technology
M.S., University of Minnesota; MT (ASCP)
Development, evaluation, and application of clinical chemistry methodology

Robert N. Hanson, Associate Professor of Medicinal Chemistry; Director of the M.S. Programs in Medicinal Chemistry and Radiopharmaceutical Science
Ph.D., University of California at Berkeley
Design, synthesis, and evaluation of organo-medicinal radiopharmaceuticals for use in nuclear medicine.

O. James Inashima, Professor of Pharmacology and Pharmacy
Ph.D., Thomas Jefferson Medical School of Philadelphia
Ultrastructural study of renal effects of nutritional and medicinal agents; characteristics of normative aging factors with potential effects on pharmacokinetics and aging

Barry L. Karger, Professor of Chemistry and Medicinal Chemistry; Director of the Institute of Chemical Analysis, Applications, and Forensic Science
Ph.D., Cornell University
High-performance liquid chromatography, chiral separations, ultra-trace organic analysis

Britta L. Karlsson, Associate Professor of Medical Laboratory Science
M.S., Northeastern University; MT (ASCP)
Medical technology education in other countries; hematology, particularly morphologic hematology

John Klaas II, Assistant Professor of Medical Laboratory Science
Ph.D., University of North Carolina; SM (AAM)
Clinical microbiology and physiology of parasitic protozoa

Philip W. LeQuesne, Professor of Chemistry and Medicinal Chemistry; Chairperson of the Department of Chemistry
Ph.D., University of Auckland, New Zealand
Chemistry of natural products, especially alkaloids, terpenoids, and steroids; physiologically active compounds from natural products

S. James Matthews, Assistant Professor of Clinical Pharmacy
Pharm.D., University of Minnesota
Influence of disease state on pharmacokinetics of medications

Alan H. Mutnick, Assistant Professor of Clinical Pharmacy
Pharm.D., Wayne State University
Pharmacotherapeutics and clinical use of cardiac drugs; use of practical pharmacokinetics techniques in patient care

John L. Neumeyer, Professor of Medicinal Chemistry and Chemistry; Director of the Graduate School of Pharmacy and Allied Health Professions
Ph.D., University of Wisconsin
Relationship of organic compounds to biological activity; the synthesis and structure modifications of natural products; the mechanism of action of CNS agents, antineoplastic drugs, antiarrhythmic agents, antimalarial drugs, and pesticides

Robert F. Raffauf, Professor of Pharmacognosy, Medicinal Chemistry, and Chemistry
Ph.D., University of Minnesota
Isolation and identification of potentially useful pharmaceutical agents from plants

Robert A. Schatz, Associate Professor of Pharmacology and Toxicology
Ph.D., University of Rhode Island
The role of transmethylation reaction in epilepsy

Fred Schneiweiss, Assistant Professor of Clinical Pharmacy
Pharm.D., University of Cincinnati
Use and role of drug information centers in the provision of optimal therapeutic care; use of computers in drug information practice and pharmacy education

Gerald E. Schumacher, Professor of Pharmacy; Dean of the College of Pharmacy and Allied Health Professions
Pharm.D., University of Southern California; Ph.D., Wayne State University
Pharmacokinetic principles applied to drug therapy; thermodynamic and kinetic aspects of interphase transfer

Elliot Spector, Professor of Pharmacology
Ph.D., University of Wisconsin
Microbial metabolism of barbiturates; metabolic studies on mescaline

Larry N. Swanson, Associate Professor of Clinical Pharmacy; Director of the Pharm.D. Program
Pharm.D., University of Southern California
Drug utilization and expanded clinical roles for pharmacists

Elizabeth G. Szymczak, Assistant Professor of Medical Laboratory Science
M.S., Northeastern University, MT (ASCP)
Bacterial adherence and interference in neonatal colonization

Part-Time Graduate Faculty

Jeffrey B. Blumberg, Associate Professor of Pharmacology and Toxicology
Ph.D., Vanderbilt University School of Medicine

John A. Correia, Lecturer in Pharmacy
Ph.D., Lowell Technological Institute

Catherine E. Costello, Lecturer in Medicinal Chemistry
Ph.D., Georgetown University

Michael A. Davis, Clinical Professor of Radiopharmaceutical Science
Sc.D., Harvard School of Public Health

George T. Gallagher, Lecturer in Pharmacology
D.M.D., Tufts University

Patricia E. Garrett, Adjunct Assistant Professor of Clinical Chemistry
Ph.D., University of Colorado

William A. Gouveia, Clinical Associate Professor of Pharmacy; Director of the M.S.
Program in Hospital Pharmacy
M.S., Northeastern University

Alun Jones, Clinical Associate Professor of Radiopharmaceutical Science
Ph.D., Liverpool University, England

Arnold Marglin, Clinical Associate Professor of Health Science
M.D., Ph.D., Rockefeller University

Frank Moy, Lecturer in Medical Laboratory Science
M.S.E.M., Northeastern University

Ellen Rorke, Lecturer in Physiology
Ph.D., University of Connecticut

Andre Rosowsky, Adjunct Professor of Medicinal Chemistry
Ph.D., University of Rochester

Joseph M. Sceppa, Clinical Assistant Professor of Pharmacy
M.S., Northeastern University

Richard T. Schelfe, Lecturer in Pharmacy
Pharm.D., University of Michigan

Paul Smith, Lecturer in Pharmacy
M.S., Boston University

John W. Webb, Clinical Professor of Pharmacy
M.S., Massachusetts College of Pharmacy

Bruce Weiner, Clinical Assistant Professor of Pharmacy
M.S. University of Florida

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 Roland H. Moody, A.B., B.L.S., *Director of the University Libraries*
 Edmund J. Mullen, B.A., M.Ed., *University Registrar*
 J. Edward Neighbor, B.S., M.S., Ph.D., *Associate Dean of the College of Arts and Sciences, Director of the Graduate School*
 John L. Neumeyer, B.S., Ph.D., *Director of the Graduate School of Pharmacy and Allied Health Professions*
 Paul M. Pratt, B.S., M.Ed., *Dean of the Department of Cooperative Education*
 John Proakis, B.S., M.S., Ph.D., *Associate Dean of Engineering and Director of the Graduate School of Engineering*
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 Janice Walker, A.B., *Assistant Dean and Director of the Graduate School of Boston-Bouvé College of Human Development Professions*
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 Royal K. Toebes
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 Roy L. Wooldridge

*Two faculty representative to be selected by the Faculty Senate Agenda Committee.

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 Franklyn K. Brown
 Richard L. Canale
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 **Gerald E. Schumacher
 Wallace W. Sherwood
 Marilyn M. Smith
 Michael R. Vaughn
 Nancy Walden
 Robert N. Wiener
 John Zotos
 **Appointed by the President

Campus Map



The Academic Year

Academic Calendar

■ Fall Quarter 1982

Registration period		
Burlington	Sept. 14-15	1:00-3:00 p.m., 5:30-8:00 p.m.
Boston	Sept. 20-23	1:00-8:00 p.m.
Classes begin	Sept. 27	
Last day to drop a course without receiving a "W"	Oct. 29	
Examination period	Dec. 13-18	

■ Winter Quarter 1982-1983

Registration period		
Burlington	Nov. 30	1:00-3:00 p.m., 5:30-8:00 p.m.
Boston	Dec. 6-9	1:00-3:00 p.m., 5:30-8:00 p.m.
Classes begin	Jan. 3	
Last day to drop a course without receiving a "W"	Feb. 4	
Examination period	March 21-26	

■ Spring Quarter 1983

Registration period		
Burlington	March 8	1:00-3:00 p.m., 5:30-8:00 p.m.
Boston	March 14-17	1:00-3:00 p.m., 5:30-8:00 p.m.
Classes begin	April 4	
Last day to drop a course without receiving a "W"	May 6	
Examination period	June 13-18	
Spring Commencement	June 19	

■ Summer Quarter 1983

Registration period		
Burlington	June 13-14	5:30-8:00 p.m.
Boston	June 15-16	5:30-8:00 p.m.
Classes begin	June 27	

University Holidays

Columbus Day	Monday	October 11
Veterans Day	Thursday	November 11
Thanksgiving Recess	Thursday–Saturday	November 25–27
Christmas Vacation	Monday–Saturday	Dec. 20–Jan. 1
Martin Luther King Day	Saturday	January 15
Washington's Birthday	Monday	February 21
Patriot's Day	Monday	April 18
Memorial Day	Monday	May 30
Independence Day	Monday	July 4
Labor Day	Monday	September 5

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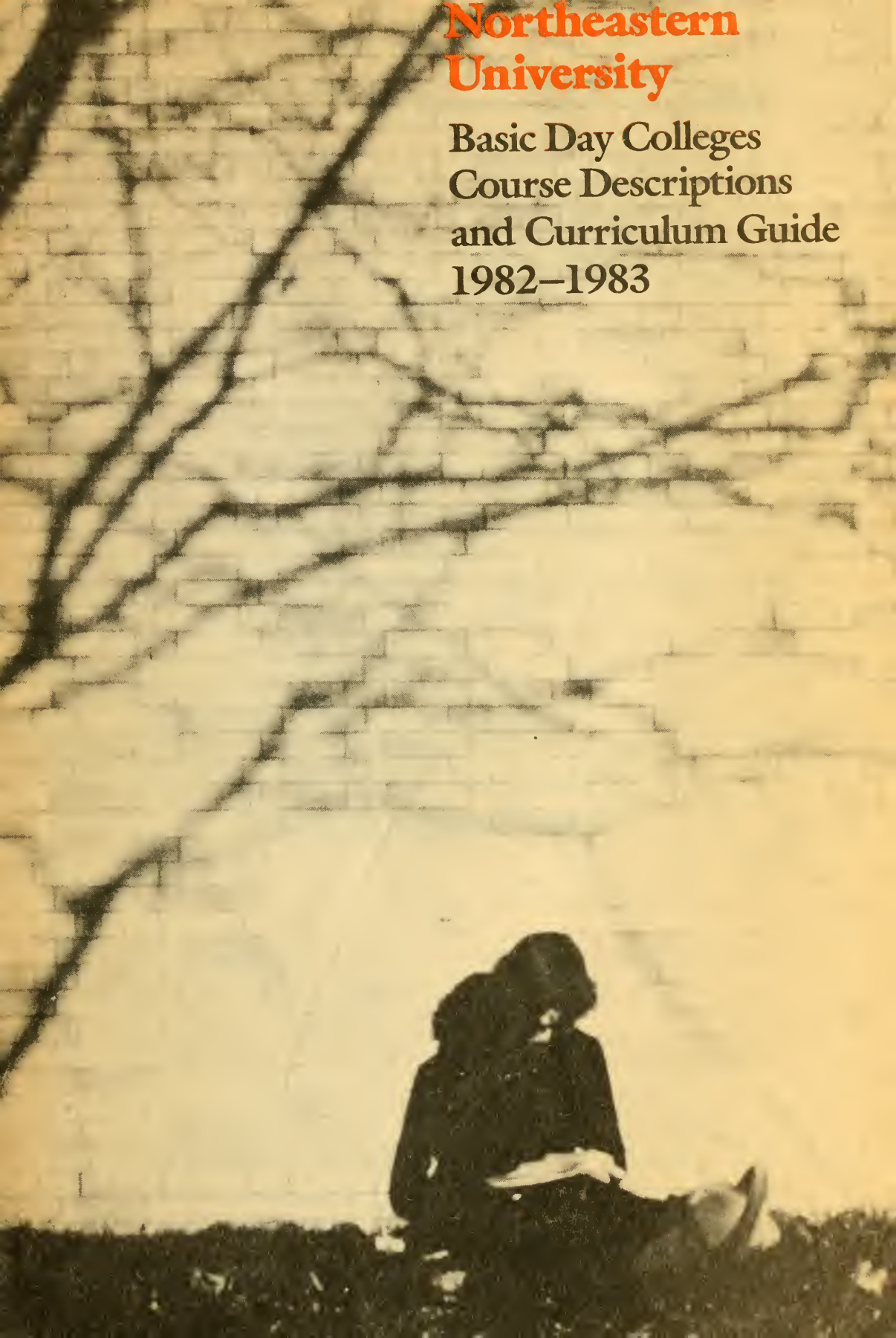
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Northeastern University

Basic Day Colleges Course Descriptions and Curriculum Guide 1982–1983



Northeastern University

Basic Day Colleges

Course Descriptions

and Curriculum Guide

1982-1983

College of Arts and Sciences
Boston-Bouv  College of Human
Development & Professions
College of Business Administration
College of Computer Science
College of Criminal Justice
College of Engineering
Lincoln College
College of Nursing
College of Pharmacy and
Allied Health Professions
University College Alternative
Freshman-Year Program

Northeastern University charges additional tuition for all courses taken above the normal academic load.

The University reserves the right to make changes in the regulations and courses announced in this bulletin.

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September 1982**

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Delivery of Services

The University assumes no liability, and hereby expressly negates the same, for failure to provide or delay in providing educational or related services or facilities or for any other failure or delay in performance arising out of or due to causes beyond the reasonable control of the University, which causes include, without limitation, power failure, fire, strikes by University employees or others, damage by the elements, and acts of public authorities. The University will, however, exert reasonable efforts, when in its judgment it is appropriate to do so, to provide comparable or substantially equivalent services, facilities, or performance, but its inability or failure to do so shall not subject it to liability.

Equal Opportunity Policy

Northeastern University is committed to a policy of providing equal opportunity for all. In all matters involving admissions, registration, and all official relationships with students, including evaluation of academic performance, the University insists on a policy of nondiscrimination. Northeastern University is also an equal opportunity employer; it is institutional policy that there shall not be any discrimination against any employee or applicant for employment because of race, color, religion, sex, age, national origin, or on the basis of being a handicapped but otherwise qualified individual. In addition, Northeastern takes affirmative action in the recruitment of students and employees. Inquiries concerning our equal opportunity policies may be referred to the University Affirmative Action Officer and/or the Title IX coordinator, 175 Richards Hall, telephone 617-437-2139.

Accreditation Statement

Northeastern University is accredited by the New England Association of Schools and Colleges, Inc., which accredits schools and colleges in the six New England states. Accreditation by the Association indicates that the institution has been carefully evaluated and found to meet standards agreed upon by qualified educators.

Children's Center

Northeastern University operates a Children's Center in 123 Forsyth Building; the Center is academically housed in the Boston-Bouv   College of Human Development Professions' Department of Curriculum and Instruction. Children from age 2 years and 9 months to 6 years are eligible. For further information, phone 617-437-3929.

College of Arts and Sciences

The following models illustrate the kinds of curricula from which an upperclass student in the College of Arts and Sciences may select his/her program. Since the College offers programs leading to two degrees in most majors—the Bachelor of Arts and the Bachelor of Science—students should discuss their academic needs and goals with departmental faculty advisers and counselors in the College to determine the program most appropriate for them.

Generally, the Bachelor of Science requires greater concentration in the major field of study. Requirements for the Bachelor of Arts degree include minimum “distribution requirements” (courses in the humanities, social sciences, science/mathematics) and completion of a modern foreign language through the intermediate level.

Other programs available include an interdisciplinary major in Human Services, which is described in the University *Bulletin*, and an Independent major, whereby an eligible student may, with approval and guidance, design his/her own major. Information about these and all other programs is available in the Dean’s Office.

Junior-Senior Honors Projects

Juniors and seniors who are members of the Honors Program or who have done superior work in their majors and have a high overall academic record are invited to apply to the Honors Committee to do special honors work during two or three of their last four quarters. Such work normally takes the form of a special research project, scheduled as a four-credit-hour course during each term in which it is pursued.

Eligibility

The College of Arts and Sciences has established these standards for junior-senior honors project eligibility:

- Minimum of 3.50 cumulative GPA at Northeastern as of the time of application
- No F’s or I’s
- No C’s or D’s in major field.
- Minimum of 32 credit hours of full-time enrollment at Northeastern.

Sometimes, with the approval of the major department and the Honors Committee, exceptions can be made. The Honors Committee automatically invites all students who are eligible to submit Honors Project proposals. The committee will also review applications from students who would normally not be eligible but who can provide good reason for special consideration. Requests for special consideration can be made by faculty members on behalf of students they deem to be serious and highly motivated scholars.

Honors Program Courses Calculus for Honors Science Majors; Western Civilization; Freshman English for Honors Students; 93.xxx, yyy, zzz, Interdisciplinary Honors Seminars; 93.249, Honors Seminar: Survey of the Social Sciences; 93.250, Honors Seminar: Survey of the Natural Sciences; 93.251, Honors Seminar: Survey of the Humanities.

Adjunct Mini-Courses: Adjunct mini-courses meet for one hour per week with the instructor of a regular four-credit-hour course in which the students in the mini-course are concurrently or recently enrolled. The extra hour enables the honors students to explore the subject of the main course more thoroughly and in a small-group setting. Four mini-courses can count as a four-credit-hour elective toward graduation. The University allows students to register tuition free for one credit hour per quarter, so the adjunct mini-courses can in most cases be tuition free. The subjects of mini-courses are equitably distributed among departments. Ten to fifteen mini-courses are offered each year, three to five each term. Course numbers and a schedule of mini-courses for the school year are available from the Honors Program Office.

African-American Studies

Bachelor of Arts Bachelor of Science

African-American Studies majors may study for either the Bachelor of Arts (B.A.) or Bachelor of Science (B.S.) degree. All majors are required to take the following courses:

- 25.237 African-American History I
- 25.201 African-American Literature I
- 25.210 Contemporary Issues in Black Society
- 25.269 Race Relations in America
- 25.170 Economic Issues in Minority Communities
- 25.255 Public Policy Analysis
- 25.212 The Black Family
- 25.191 Research Seminar
- 25.195 Directed Study for Senior Thesis
- 25.194 Field Research Seminar for Seniors

Faculty advisers work with students to help them select electives within their chosen area of concentration to fulfill their distribution and language requirements for the degree of Bachelor of Arts or career package programs for the degree of Bachelor of Science.

Minor in African-American Studies

Required Courses: 25.269, Race Relations in America; 25.191, Research Seminar; and 25.200, Introduction to African-American Studies.

Elective/Concentration Clusters: Any four courses in African-American Studies of an advanced nature, to be selected by the student and department adviser in line with the student's education and career needs. For example, a student interested in health careers might select as minor electives Black Scientific Development, Community Medicine and Health Care, the Epidemiology of Black Diseases, and Poverty and Health Care.

Art And Architecture

Bachelor of Arts

27.118, 27.119, History of Art to 1400 and History of Art since 1400; twelve art electives; two history electives; one music elective; and one philosophy elective.

Foreign language and distribution requirements.

Bachelor of Science

27.118, 27.119, History of Art to 1400 and History of Art since 1400; twelve art electives; two history electives; one music elective; and one philosophy elective.

Minors in Art

History of Architecture: 27.177, Introduction to Architecture; 27.205, Introduction to Architectural Design; 27.201, Architecture and the City; 27.161, American Architecture; 27.178, Technology, Architecture, and the City; 27.176, Contemporary Architecture and the City.

History of Painting: 27.131, Ancient Art; 27.139, Medieval Painting and Sculpture; 27.191, Renaissance Art and Architecture; 27.137, French Painting; 27.162, American Sculpture and Painting.

Film and Photography: 27.121, Contemporary Directions in Cinema; 27.163, The American Film; 27.190, Filmmaking Workshop; 27.189, Basic Photography I; 27.202, Basic Photography II; 27.199, Intermediate Photography Workshop.

General Minor: Selection of any six courses from the department curriculum.

Please note: For the past three years the Art Department has been offering an *art major* rather than an art history major. This has been fully approved by the College. Please change your records accordingly.

Biology

Bachelor of Arts

18.111, Principles of Biology I; 18.112, Principles of Biology II; 18.113 Vertebrate Systems, Bio III; 18.134, Environmental and Population Biology; 18.135, Genetics and Developmental Biology; 18.136, Cell Physiology and Biochemistry (formerly called Biology); four biology electives approved by department Advisory Committee.

Fundamentals of Mathematics or Calculus (one year); 11.171, 11.172, Physics for the Life Sciences I and II; 11.173, 11.174, Physics Laboratory for the Life Sciences I and II, or 11.117, Physics for Science Majors I; 11.119, Physics for Science Majors III; 11.147, 11.149, Physics Laboratory for Science Majors I and III; 12.106, General Chemistry; 12.119, General Chemistry II; 12.171, Analytical Chemistry; 12.144, 12.145, Organic Chemistry I and II.

Foreign language and distribution requirements.

Bachelor of Science

18.111, Principles of Biology I; 18.112, Principles of Biology II; 18.113, Vertebrate Systems, Bio III; 18.134, Environmental and Population Biology; 18.135, Genetics and Developmental Biology; 18.136, Cell Physiology and Biochemistry; 18.280, Senior Seminar; four biology electives approved by department Advisory Committee.

Calculus (one year); 11.117, 11.118, 11.119, Physics for Science Majors I, II and III; 11.147 and 11.148, Physics Laboratory for Science Majors I and II, or 11.149, Physics Laboratory for Science Majors III; 12.106, General Chemistry I; 12.119, General Chemistry II; 12.171, Analytical Chemistry; 12.144, 12.145, Organic Chemistry I and II; two approved science electives.

Foreign language requirement.

Chemistry

Bachelor of Arts

12.127, 12.128, General Chemistry I and II; 12.129, The Chemical Elements; 12.172, Analytical Chemistry; 12.153, 12.154, 12.155, Organic Chemistry I, II, and III; 12.161, 12.162, 12.168, Physical Chemistry I, II, and III; 10.184, Calculus and Linear Methods I, or 10.153, Calculus; 12.179, Instrumental Analysis.

10.181, 10.182, 10.183, Calculus I, II, and III; 11.117, 11.118, 11.119, Physics for Science Majors I, II, and III; 11.148, 11.149, Physics Laboratory for Science Majors II and III.

Foreign language and distribution requirements.

Bachelor of Science

12.127, 12.128, General Chemistry I and II; 12.129, The Chemical Elements; 12.172, Analytical Chemistry; 12.153, 12.154, 12.155, Organic Chemistry I, II, and III; 12.161, 12.162, 12.168, Physical Chemistry I, II, and III; 10.184, Calculus and Linear Methods I, or 10.153, Calculus; 12.179, Instrumental Analysis; 12.213, Inorganic Chemistry; 12.532, Identification of Organic Compounds; two advanced science or mathematics electives; one advanced laboratory.

10.181, 10.182, 10.183, Calculus I, II, and III; 10.186, Differential Equations and Linear Methods I, or 10.156, Mathematical Analysis; 11.117, 11.118, 11.119, Physics for Science Majors I, II, and III; 11.148, 11.149, Physics Laboratory for Science Majors II and III.

Minor in Chemistry

After a general chemistry sequence, 12.172, Analytical Chemistry; 12.153, 12.154, 12.155, Organic Chemistry I, II, III; 12.161, 12.162, Physical Chemistry I, II.

Drama

Bachelor of Arts

The following courses are to be taken by students in their freshman year: 29.121, Theatre Appreciation; 29.122, Theatre Experience. (Those

students entering the major after their freshman year may waive the requirements of 29.121 and 29.122 by successfully completing a departmental examination.

After his/her freshman year, the student selects one of three specializations—acting and directing, technical theatre, or playwriting/dramatic criticism/theatre history—and enrolls in the courses required for the particular concentration selected:

Acting and Directing: 29.109, Speech for the Theatre; 29.110, Voice and Articulation; 29.111, Oral Interpretation; 29.130, Stage Makeup; 29.151, Acting II; 29.156, Body Movement I; 29.161, Problems in Direction.

Technical Theatre: 29.130, Stage Makeup; 29.172, Set Design for the Stage; 29.173, Lighting Design for the Stage; 29.175, Costuming I; 29.176, Costuming II; 29.178, Theatre Crafts.

Playwriting/Dramatic Criticism/Theatre History: 29.111, Oral Interpretation; 29.161, Problems in Direction; 29.172, Set Design for the Stage; 29.180, Playwriting I; 29.181, Playwriting II; 29.107, New Trends in American Theatre.

In addition, all Drama majors must complete the following courses: 29.150, Acting I; 29.160, Concepts of Direction; 29.170, Stagecraft; 29.200, Theatre History I; 29.201, Theatre History II; 29.218, Research for Theatrical Production; 29.240, Dramatic Theory/Criticism; 29.164, 29.165, 29.166, and 29.167, Theatre Practicum; and 29.280, Senior Project in Drama.

Eight quarter hours psychology or four quarter hours each anthropology and sociology.

Foreign language and distribution requirements.

In addition, the Department recommends that a physical education skills course be selected each quarter.

Bachelor of Science

The following courses are to be taken by students in their freshman year: 29.121, Theatre Appreciation; 29.122, Theatre Experience. (Those students entering the major after their freshman year may waive the requirements of 29.121 and 29.122 by successfully completing a departmental examination.)

After his/her freshman year, the student selects one of three specializations—acting and directing, technical theatre, or playwriting/dramatic criticism/theatre history—and enrolls in the courses required for the particular concentration selected:

Acting and Directing: 29.109, Speech for the Theatre; 29.110, Voice and Articulation; 29.111, Oral Interpretation; 29.130, Stage Makeup; 29.151, Acting II; 29.156, Body Movement I; 29.161, Problems in Direction.

Technical Theatre: 29.130, Stage Makeup; 29.172, Set Design for the Stage; 29.173, Lighting Design for the Stage; 29.175, Costuming I; 29.176, Costuming II; 29.178, Theatre Crafts.

Playwriting/Dramatic Criticism/Theatre History: 29.111, Oral Interpretation; 29.161, Problems in Direction; 29.172, Set Design for the Stage; 29.180, Playwriting I; 29.181, Playwriting II; 29.207, New Trends in American Theatre.

In addition, all Drama majors must complete the following courses: 29.150, Acting I; 29.160, Concepts of Direction; 29.170, Stagecraft; 29.200, Theatre History I; 29.201, Theatre History II; 29.218, Research for Theatrical Production; 29.240, Dramatic Theory/Criticism; 29.164, 29.165, 29.166, and 29.167, Theatre Practicum; and 29.280, Senior Project in Drama.

In addition, the Department recommends that a physical education skills course be selected each quarter.

Minor in Drama	Required of all minors: 29.121, Theatre Appreciation, and 29.122, Theatre Experience. Six additional courses must be taken in one of the three tracks, including: <i>Performance:</i> 29.150, Acting I; 29.160, Concepts of Direction; 29.156, Body Movement I; 29.159, Theatre Games; 29.185, Children's Theatre. <i>Technical Theatre/Design:</i> 29.170, Stagecraft; 29.172, Scene Design; 29.173, Lighting Design for the Stage; 29.175, Costuming I; 29.270, Theatre Management. <i>Drama Literature and Criticism:</i> 29.200, History of the Theatre I; 29.201, History of the Theatre II; 29.180, Playwriting; 29.232, Comic Theatre; 93.160, American Musical Theatre; 29.140, Drama Criticism.
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Economics

Bachelor of Arts	39.115, 39.116, Principles and Problems of Economics I and II; 39.250, 39.251, Statistics I and II; 39.255, Microeconomic Theory; 39.256, Macroeconomic Theory; six economics electives. 10.104, 10.105, Fundamentals of Mathematics I and II; four social science electives other than economics. Foreign language and distribution requirements.
Bachelor of Science	39.115, 39.116, Principles and Problems of Economics I and II; 39.250, 39.251, Statistics I and II; 39.255, Microeconomic Theory; 39.256, Macroeconomic Theory; 39.293, Introduction to Econometrics, or 39.294, Problems in Economic Research; ten economics electives. 10.104, 10.105, Fundamentals of Mathematics I and II; four social science electives other than economics.
Minor in Economics	39.115, 39.116, Principles and Problems of Economics I and II; 39.255, Microeconomic Theory; 39.256, Macroeconomic Theory; four electives in economics. Electives to be selected with the advice of a department adviser. Any course taken outside the Department of Economics to satisfy these economics elective requirements must be approved by a faculty adviser in the Department.

English

Bachelor of Arts	30.170, 30.171, Survey of English Literature I and II; 30.180 or 30.181, Survey of American Literature I or II; one British literature course; one American literature course; one figure course; one genre course; one language and writing course; one junior-senior seminar; four English electives. Foreign language and distribution requirements.
Bachelor of Science	30.170, 30.171, Survey of English Literature I and II; 30.180 or 30.181, Survey of American Literature I or II; one British literature course; one American literature course; one figure course; one genre course; one language or writing course; one junior-senior seminar; four English electives.
Minor in Literature	Distribution requirements as required for the Bachelor of Arts program. <i>Six courses required.</i> Two survey courses required from the following: 30.170, Survey of English Literature I; 30.171, Survey of English Literature II; 30.180, Survey of American Literature I; 30.181, Survey of American Literature II. One course each from two of the following categories: (a) language or writing (e.g., History of the English Language, linguistics, semantics, criticism, creative writing, expository writing); (b) British literature; (c) American literature; (d) major figure; or (e) genre. One elective. Junior-senior seminar.

Minor in Writing

Six courses required. Four courses from among the following writing courses: 30.104, Intermediate Expository Writing; 30.108, Creative Writing; 30.228, Nonfiction Workshop; 30.200, Technical Writing I; 30.201, Technical Writing II; 30.203, Writing for the Professions: Health Services; 30.204, Advanced Expository Writing; 30.205, Writing for the Professions: Business Administration; 30.206, The Literature of Engineering; 30.207, Writing for the Professions: Criminal Justice; 30.208, Poetry Workshop; 30.209, Fiction Workshop; 30.215, Publication Arts. Two elective courses (if the student desires, one or both of the electives may be selected from the writing courses listed above).

Sample Programs: (a) 30.108, Creative Writing; 30.228, Nonfiction Workshop; 30.209, Fiction Workshop; 30.208, Poetry Workshop; 30.154, Modern Short Story; 30.167, Literature and Politics; (b) 30.104, Intermediate Expository Writing; 30.200, Technical Writing I; 30.201, Technical Writing II; 30.204, Advanced Expository Writing; 30.215, Publication Arts; 30.168, Literature and Science.

Geology

Bachelor of Arts

16.201, Physical Geology; 16.203, Physical Geology Laboratory; 16.202, Historical Geology; 16.204, Historical Geology Laboratory; 16.215, Descriptive Mineralogy; 16.217, Optical Crystallography; 16.218, Petrography; 16.271, Geology Seminar; six geology electives.

10.104, 10.105, Fundamentals of Mathematics I and II, or 10.105, 10.107, Calculus I and II; 11.117, Physics for Science Majors I, or 11.171, Physics for the Life Sciences I; 12.106, General Chemistry I; 12.119, General Chemistry II.

Foreign language and distribution requirements.

Bachelor of Science

10.105, 10.107, Calculus I and II, or 10.150, 10.151, 10.152, Calculus I, II, and III; 11.117, 11.118, 11.119, Physics for Science Majors I, II, and III; 12.106, 12.119, or 12.127, 12.128, General Chemistry I and II; 12.172 or 12.171, Analytical Chemistry, or 12.161, Physical Chemistry, or 16.214, Geochemistry; two approved additional science electives; six courses in the humanities and/or social sciences; 16.271, Senior Seminar; eight geology electives.

Minor in Geology

16.201, Physical Geology; 16.202, Historical Geology; 16.215, Descriptive Mineralogy; plus two of the following one-credit laboratories: 16.203, Physical Geology Laboratory; 16.204, Historical Geology Laboratory; 16.206, Rock Identification Laboratory; plus four geology electives (16.214 or higher number) chosen with the approval of the Earth Science Department.

History

Bachelor of Arts

23.101, 23.102, Western Civilization I and II; 23.210, 23.211, United States to 1877 and United States since 1877; 23.199, The Historian's Craft; ten history electives distributed as follows; two courses in Group A (ancient, medieval, early modern Europe); two courses in Group B (modern Europe); two courses in Group C (America); two courses in Group D (other regions); two courses in any of the above groups.

Foreign language and distribution requirements.

Recommended: courses in the related social sciences.

Bachelor of Science

23.101, 23.102, Western Civilization I and II; 23.210, 23.211, United States to 1877 and United States since 1877; 23.199, The Historian's Craft; 23.200, Social Science Methodology; twelve history electives distributed as follows: two courses in Group A (ancient, medieval, early modern Europe); two courses in Group B (modern Europe); two courses in Group C (America); two courses in Group D (other regions); four courses in any of the above groups.

One course in Introductory Statistics (e.g., 19.120, 21.239, 39.250). One course in computers from the following: 10.108, Probability, Statistics, and the Computer; 10.130, Introduction to Computers and Computations; 93.113, Computers for the Social Sciences. Three of the following: 39.115, Principles of Economics; 21.100, Introduction to Sociology; 20.100, Principles of Social Anthropology; 22.110, Introduction to Politics; 19.105, Foundations of Psychology; 18.119, Environment and Man. (Substitutions only with approval of the Department Chairperson.)

Minor in History

Thirty-two quarter hours of history, of which eight quarter hours must be selected from the following: 23.101, Western Civilization I; 23.102, Western Civilization II; 23.210, United States to 1877; 23.211, United States since 1877.

Human Services

Bachelor of Arts

Prerequisite Courses (six): 21.100, Introduction to Sociology, or 50.114, Education and Social Science; 50.166, The Human Services Professions; 19.105 and 19.106, Foundations of Psychology I and II, or 50.121 and 50.131, Human Development and Learning I and II; 22.111, Introduction to American Government; 39.115 or 39.116, Principles and Problems of Economics or equivalent.

Core Courses (nine): 19.120, Statistics in Behavioral Science I, or 21.239, Introduction to Statistical Analysis, or 50.142, Introduction to Educational Statistics; 19.160, Experimental Design in Psychology, or 21.240, Research Methods I, or 21.243, Human Services Research and Evaluation, or 22.120, Conceptual Foundations of Contemporary Political Analysis; 21.157, Sociology of Human Services Organizations; 19.135, Personality I; 19.202, Abnormal Psychology I; 50.167, Education and Psychosocial Development; 29.141, Interpersonal Communications II, or 29.117, Group Discussion, or 50.133, Educational Applications of Social Psychology, or 50.161, Seminar in Group Process; 53.266, Intervention Strategies; 93.232, Senior Seminar.

Specified Electives (any three courses): 21.112, Sociology of Poverty; 21.125, The Sociology of Private and Public Assistance; 21.221, Seminar in Social Welfare; 22.160, The Politics of Poverty; 39.278, Income Inequalities and Discrimination; 25.210, Contemporary Issues in Black Society; 25.224, Black Cultural Development in the United States; 25.279, Minorities, Ethnicity, and Human rights; 50.164, Class and Ethnic Relations in Education; 56.120, Introduction to Special Education.

Specializations (five courses in any one specialization): Specializations are individually constructed by the student and his/her adviser. Alternatives are grouped in three broad clusters: Clinical, Community, and Administration.

Fieldwork: 93.230, Human Services Fieldwork I; 93.231, Human Services Fieldwork II.

Interdisciplinary

Independent Major

An eligible student may petition the College Curriculum Committee to meet requirements for the B.A. degree in an Independent major. Eligibility, procedures, and requirements must be discussed in advance with an adviser in the Dean's Office. No student may be considered an Independent major until a curriculum proposal has been submitted to, and approved by, the Curriculum Committee.

Minor in Media Studies

To qualify for a minor in Media Studies, the student must complete a minimum of seven courses distributed as follows: Required Courses (two): 29.127, The Mass and the Media; and 29.119, Communication Theory, or 29.133, Theories of Audience Behavior, or 93.145, Exploring Humanities through Film. One elective course from each of the following categories (total of five): Media and Culture (appreciation and

criticism), Media Studies (historical and structural aspects), Media Production, and two additional electives from any of the three categories above or interdisciplinary course choices subject to adviser approval. Individual student programs will be developed in consultation with faculty advisers. Interested students should contact Professor Herman (History Department) for information on program development and elective choices.

Journalism

Bachelor of Arts Bachelor of Science

Each major will complete the journalism core and one of four concentrations—Newspaper/Print, Radio-Television News, Advertising, or Public Relations—to correspond with his/her career objective.

Journalism Core: 38.101, History of Journalism; 38.102, Journalism Ethics and Issues; 38.103, Newswriting I; 38.104, Newswriting II; 38.106, Editing; 38.108, Law of the Press; 38.201, Photojournalism.

Newspaper/Print Concentration: 38.105, Techniques of Journalism; 38.132, Local Government Reporting; 38.140, Design and Graphics; 38.175, Publication Production and Management; one journalism elective.

Radio-Television News Concentration: 38.120, Radio News Gathering and Writing; 38.121, Television Newswriting; 38.122, Television News Production; 38.290, Directed Study; one journalism elective.

Public Relations Concentration: 38.136, Public Relations Principles; 38.140, Design and Graphics; 38.160, Public Relations Problems; 38.161, Public Relations Practice; one journalism elective.

Advertising Concentration: 38.140, Design and Graphics; 38.150, Advertising Principles; 38.151, Advertising Copy Writing; 38.152, Advertising Practice; one journalism elective.

Each major will complete the following related requirements:

30.103, Grammar for Journalists; 30.113, Freshman Writing; 30.114, Introduction to Literature; 30.170, Survey of English Literature I; and two courses from this list: 30.171, Survey of English Literature II; 30.180, Survey of American Literature I; 30.181, Survey of American Literature II.

22.111, Introduction to American Government; 22.141, State and Local Government; 23.210, United States to 1877; 23.211, United States since 1877; 39.115, Principles of Economics, and one additional course in economics or business; 37.271, Introduction to Communication Research, or the equivalent; 26.150, Introduction to Logic; 26.131, Social and Political Philosophy; 23.101, Western Civilization I; 23.102, Western Civilization II; 90.135, Professional Development for Journalists.

Introduction to Art, Drama, and Music or one course from each of the following categories—(a): 27.152, Introduction to Art; 27.197, Art and Society; 27.119, History of Art II; 27.162, American Sculpture and Painting; (b): 28.100, Music I; 28.120, Survey of Music History; 28.250, Music as a Listening Experience; 29.121, Theater Appreciation.

Bachelor of Arts

In addition to the journalism and related requirements above, candidates for the Bachelor of Arts degree will complete four courses in science and/or math and will complete a modern language through the college intermediate level.

Bachelor of Science

In addition to the journalism and related requirements above, candidates for the Bachelor of Science degree will complete six courses in science and/or math.

Linguistics

Bachelor of Arts

Freshman Requirements: 30.113, Freshman Writing; 30.114, Introduction to Literature; mathematics course; two courses from the humanities; two from the sciences; and two from the social sciences.

Distribution Requirements: One or more additional science courses and two or more additional humanities courses for a total of five additional courses in science and humanities. (Some of these requirements can be met by fulfilling the general requirements and additional course requirements in the major.)

General Requirements: 30.120, Introduction to Linguistics; 19.155, Introduction to Language and Cognition; 19.152, Introduction to Phonetics and Phonology; 20.130, Language and Culture (or an advanced course in same area); 30.125, Grammars of English; 33.235, Applied Linguistics, or 33.236, Advanced Applied Linguistics.

Language Proficiency: Two advanced courses in a spoken second language (see Bachelor of Sciences for proficiency in American Sign Language).

Additional Courses: Five courses from the following: 19.151, Bilingualism; 19.153, Child Language; 19.154, Linguistics of American Sign Language; 19.157, Cognition; 19.182, Neurolinguistics; 19.235, Animal Communication; 19.247, Body Language; 26.127, Philosophy of Language; 26.151, Symbolic Logic; 30.121, Foundations of the English Language; 30.126, Transformational Grammar; 30.130, Introduction to Semantics; 30.131, Topics in Linguistics; 33.236, Advanced Applied Linguistics; 33.237, Language Testing.

Laboratory Course: 19.195, Laboratory in the Psychology of Language.

Seminars: Two of the following: 19.272, Seminar in the Psychology of Language; 19.277, Seminar in Speech and Language Processing; 30.280, Seminar in Stylistics.

Practicum: One course: fieldwork, directed study, sign language teaching, or interpreting.

Bachelor of Science

Same requirements as the Bachelor of Arts, except that American Sign Language can count toward the second-language proficiency requirement.

Mathematics

Bachelor of Arts

10.181, 10.182, 10.183, Calculus I, II, and III; 10.184, 10.185, Calculus and Linear Methods I and II; 10.186, 10.187, Differential Equations and Linear Methods I and II; 10.246, Linear Algebra; 10.250, Analysis I; four approved mathematics electives selected in consultation with an adviser.

11.117, 11.118, 11.119, Physics for Science Majors I, II, and III.

Foreign language and distribution requirements.

Bachelor of Science

10.181, 10.182, 10.183, Calculus I, II, and III; 10.184, 10.185, Calculus and Linear Methods I and II; 10.186, 10.187, Differential Equations and Linear Methods I and II; 10.246, Linear Algebra; 10.250, Analysis I; seven approved mathematics electives selected in consultation with an adviser.

11.117, 11.118, 11.119, Physics for Science Majors I, II, and III; two non-science courses.

Bachelor of Science in Computer Science

The Bachelor of Science degree in Computer Science is conferred jointly with the College of Engineering (Department of Industrial Engineering).

The general course requirements, for a total of 179 quarter hours, are: Twenty-four quarter hours of calculus-based mathematics, including 10.150-10.153, Calculus; 10.210, Discrete Mathematics; 10.246, Linear Algebra. Eight quarter hours of calculus-based probability and statistics (10.208 and 10.220).

Twenty quarter hours in algorithms and programming, including both assembly languages and high-level languages (06.100 and 06.101, Computer Science I and II; 09.XXX, Applied Programming; 06.130, 06.131 Assembly Language I and II).

Twelve quarter hours in physics (or, in special cases, chemistry or biology).

Thirty-six quarter hours of social science/humanities, English, and professional writing.

Forty quarter hours of computer science, including 06.220, File Processing; 06.201, Data Structures; 06.265, Analysis of Algorithms; 06.240, Programming Languages; 06.230, Operating Systems; 06.260, Compilers; 06.250, Automata; 06.291, Project; and 06.295, Seminar.

Eight quarter hours of computer design and organization (03.191 and 03.192).

Twenty-eight quarter hours of student-selected coordinated studies.

Three quarter hours of Programming Language Laboratory (06.110, 06.111, and 06.112).

Minor in Computer Science *Required Courses:* 10.130, Introduction to Computers and Computations; 10.131, Introduction to Computer Sciences; 10.214 or 06.130, Assembly Language; 10.215 or 06.201, Data Structures.

Electives: Three advanced mathematics or computer science courses, which must be approved by the department.

Modern Languages

Bachelor of Arts

Eight advanced electives in the major language,* two advanced electives in the minor language.*

30.170, 30.171, Survey of English Literature I and II; 23.101, 23.102, Western Civilization I and II; two additional history electives.

Distribution requirements.

Bachelor of Science

Twelve advanced electives in the major language,* including two conversation and composition courses; six advanced electives in the minor language,* including two conversation and composition courses.

23.101, 23.102, Western Civilization I and II.

**Courses beyond the intermediate level.*

Philosophy

Bachelor of Arts

26.110, Classic Greek Philosophers; 26.111, Modern Philosophy; 26.150, Introduction to Logic, or 26.151, Symbolic Logic; 26.152, Theory of Knowledge, or 26.153, Metaphysics, or 26.155, Moral Philosophy; one philosophy seminar; eight philosophy electives.

Foreign language and distribution requirements.

Bachelor of Science

26.110, Classic Greek Philosophers; 26.111, Modern Philosophy; 26.150, Introduction to Logic, or 26.151, Symbolic Logic; 26.152, Theory of Knowledge, or 26.153, Metaphysics, or 26.155, Moral Philosophy; one philosophy seminar; eight philosophy electives.

Minor in Philosophy

To qualify for a minor in philosophy, a student must take 28 quarter hours in philosophy. These will be distributed as follows:

Introductory Courses: 26.101, introduction to Philosophy I, or 26.102, Introduction to Philosophy II, or 26.105, Introduction to Scientific Method. *History of Philosophy:* 26.110, Classical Greek Philosophy, or 26.111, Modern Philosophy. *Logic Requirement:* 26.150, Introduction to Logic, or, 26.151, Symbolic Logic. At least one of the following courses: 12.125, Philosophy of Mind; 26.152, Theory of Knowledge; 26.153, Metaphysics; 26.155, Moral Philosophy. *Electives:* Three electives in Philosophy.

Physics

Bachelor of Arts

11.117, 11.118, 11.119, Physics for Science Majors I, II, and III, and their associated laboratories—11.147, 11.148, 11.149; 11.127, Intermediate Mechanics; 11.128, Electric and Magnetic Fields; three upper-level physics lecture courses; three upper-level physics laboratory courses.

10.181, 10.182, 10.183, Calculus I, II, and III; 10.184, 10.185, Calculus and Linear Methods I and II; one advanced mathematics elective.

Foreign language and distribution requirements.

Bachelor of Science

11.117, 11.118, 11.119, Physics for Science Majors, I, II, and III, and their associated laboratories—11.147, 11.148, 11.149; 11.127, Intermediate Mechanics; 11.128, Electric and Magnetic Fields; 11.208, Mathematical Physics; 11.220, Thermodynamics and Kinetic Theory; 11.221, Wave Motion and Optics; 11.230, Modern Physics; 11.200, Classical Mechanics; 11.211, 11.212, Electricity and Magnetism I and II; three upper-level physics laboratory courses.

10.181, 10.182, 10.183, Calculus I, II, and III; 10.184, 10.185, Calculus and Linear Methods I and II; two advanced mathematics electives; five additional electives from those approved for majors in the following fields: physics, mathematics, chemistry, engineering, biology, and geology.

Political Science

Bachelor of Arts

22.110, Introduction to Politics; 22.111, Introduction to American Government; 22.112, Introduction to International Relations; 22.113, Introduction to Foreign Governments and Societies (formerly Introduction to Comparative Politics); 22.261, Public Administration; one political theory/thought course selected from the following: 22.270, 22.273, 22.274; seven political science electives.

Six social science electives selected from at least three of the following areas: African-American studies, anthropology, economics, history, psychology, and sociology.

Foreign language and distribution requirements.

Bachelor of Science

22.110, Introduction to Politics; 22.111, Introduction to American Government; 22.112, Introduction to International Relations; 22.113, Introduction to Foreign Governments and Societies (formerly Introduction to Comparative Politics); *22.121, Research Methods I; *22.122, Research Methods II; 22.261, Public Administration; and one political theory/thought course selected from the following: 22.270, 22.273, 22.274; six political science electives.

Six social science electives selected from at least three of the following areas: African-American studies, anthropology, economics, history, psychology, and sociology.

*22.121 and 22.122 replace 22.280, 22.281, and 22.286.

Minor in Political Science

Any two of the following courses: 22.110, Introduction to Politics; 22.111, Introduction to American Government; 22.112, Introduction to International Relations; 22.113, Introduction to Foreign Governments and Societies; 22.261, Public Administration. Any five additional courses offered by the Department of Political Science for Political Science majors, including courses listed above that have not been selected to fulfill the above requirement.

Concentration in Public Administration

Bachelor of Science

22.110, Introduction to Politics; 22.111, Introduction to American Government; *22.121, Research Methods I; †22.122, Research Methods II; 22.260, Public Policy Analysis; 22.261, Public Administration; 22.266, Public Personnel Administration; 22.267, Public Budgeting; ‡22.262, Organization Theory; and one political theory/thought course selected from the following: 22.270, 22.273, 22.274; four public administration electives.

* Replaces 22.281.

† New degree requirement for students entering or transferring into Northeastern in fall 1975 or later.

‡ New degree requirement for students entering or transferring into Northeastern in fall 1977 or later.

Six social science electives selected from at least three of the following areas: African-American studies, anthropology, economics, history, psychology, and sociology.

Psychology

Bachelor of Arts

General Requirements: Freshman requirements (see note 1); Arts and Sciences distribution requirements; Foreign Language requirements; 23.101, Western Civilization I, or 23.102, Western Civilization II; 19.105 and 19.106, Foundations of Psychology I and II; 19.120 and 19.121, Statistics in Behavioral Sciences I and II; 19.130, Social Psychology, or 19.135, Personality I; 19.149, Sensation, or 19.150, Perception; 19.155, Language and Cognition; 19.164, Learning and Motivation I; and 19.178, Physiological Bases of Psychology I.

Students choose either General Psychology or one of four areas of concentration: Language and Cognition; Learning and Behavior Analysis; Personality and Social Psychology; or Sensory and Neuropsychology. The additional courses required for each concentration follow:

General Psychology: four psychology electives (see note 2); three psychology laboratories; and one psychology seminar.

Language and Cognition: 19.151, Bilingualism; 19.152, Introduction to Phonetics; two psychology electives (see note 2); 19.195, Laboratory in Psycholinguistics; 19.290, Directed Study in Language and Cognition; one additional psychology laboratory; and 19.271, Seminar in Cognition, or 19.272, Seminar in the Psychology of Language.

Learning and Behavior Analysis: 19.168, Behavior Change in Institutions; 19.169, Learning and Motivation II; one of the PSI Teaching Practica, 19.250-19.268 (even numbered); one of the Advanced PSI Teaching Practica, 19.251-19.269 (odd numbered); 19.165, Learning and Motivation Laboratory; 19.171, Behavior Modification Laboratory; one additional psychology laboratory; and one seminar, either 19.166, Introduction to Programmed Learning; 19.270, Seminar in Behavior Theory; or 19.276, Seminar in Behavior Modification.

Personality and Social Psychology: 19.130, Social Psychology, or 19.135, Personality I (see note 3); 19.136, Personality II; 21.107, Social Psychology (see note 4); two additional courses selected from the following: 20.151, Aggression (see note 4); 20.160, Sex, Sex Roles, and Family (see note 4); 21.151, Sociology of Prejudice (see note 4); 29.115, Theories of Persuasion (see note 4). Also, 19.133, Laboratory in Social Psychology, or 19.138, Laboratory in Personality; two additional psychology laboratories; and one seminar, either 19.275, Seminar in Social Psychology; 19.273, Seminar in Clinical Psychology and Personality; or 21.207, Seminar in Social Psychology (see note 4).

Sensory and Neuropsychology: 19.149, Sensation, or 19.150, Perception (see note 3); 19.179, Physiological Bases of Psychology II; 19.180, Neuropsychology; 19.183, Biological Bases of Motivation, or 19.186, Comparative Psychology and Ethology; 19.162, Sensation and Perception Laboratory; 19.181, Laboratory in Physiological Psychology; one additional psychology laboratory; and 19.274, Seminar in Sensory and Physiological Psychology.

Bachelor of Science

General Requirements: Freshman requirements (see note 1); 23.101, Western Civilization I, or 23.102, Western Civilization II; three additional courses in mathematics, physics, chemistry, or biology, including at least one from 11.171 and 11.173, Physics for the Life Sciences I and Laboratory; 12.106, General Chemistry, or 18.131, General Biology. Also, 19.105 and 19.106, Foundations of Psychology I and II; 19.120 and 19.121, Statistics in Behavioral Sciences I and II; 19.130, Social Psychology, or 19.135, Personality I; 19.149, Sensation, or 19.150, Perception; 19.155, Language and Cognition; 19.164, Learning and Motivation I; and 19.178, Physiological Bases of Psychology.

Students choose either General Psychology or one of four areas of concentration: Language and Cognition; Learning and Behavior Analysis; Personality and Social Psychology; or Sensory and Neuropsychology. The additional courses required for each concentration follow: General Psychology: six psychology electives (see note 2); four psychology laboratories; one psychology seminar; and one Directed Study or Honors Research, from 19.290 to 19.299.

Language and Cognition: 19.151, Bilingualism; 19.152, Introduction to Phonetics; 30.120, Introduction to Linguistics (see note 4); three psychology electives (see note 2); 19.195, Laboratory in Psycholinguistics; 19.290, Directed Study in Language and Cognition; two additional psychology laboratories; 19.271, Seminar in Cognition, or 19.272, Seminar in the Psychology of Language; and one Directed Study or Honors Research, from 19.291 to 19.299.

Learning and Behavior Analysis: 19.168, Behavior Change in Institutions; 19.169, Learning and Motivation II; one of the PSI Teaching Practica, 19.250-19.268 (even numbered); one of the Advanced PSI Teaching Practica, 19.251-19.269 (odd numbered); two psychology electives (see note 2); 19.165, Learning and Motivation Laboratory; 19.171, Behavior Modification Laboratory; two additional psychology laboratories; one seminar, either 19.166, Introduction to Programmed Learning; 19.270, Seminar in Behavior Theory; or 19.276, Seminar in Behavior Modification; and one Directed Study or Honors Research, from 19.290 to 19.299 (see note 5).

Personality and Social Psychology: 19.130, Social Psychology, or 19.135, Personality I (see note 3); 19.136, Personality II; 19.186, Comparative Psychology and Ethology; 21.107, Social Psychology (see note 4); two additional courses selected from the following: 20.151, Aggression (see note 4); 20.160, Sex, Sex Roles, and Family (see note 4); 21.151, Sociology of Prejudice (see note 4); 29.115, Theories of Persuasion (see note 4). Also, 19.133, Laboratory in Social Psychology, or 19.138, Laboratory in Personality; three additional laboratories; one seminar, either 19.275, Seminar in Social Psychology; 19.273, Seminar in Clinical Psychology and Personality; or 21.107, Seminar in Social Psychology (see note 4); and one Directed Study or Honors Research, from 19.290 to 19.299 (see note 5).

Sensory and Neuropsychology: 19.149, Sensation, or 19.150, Perception (see note 3); 19.179, Physiological Bases of Psychology II; 19.180, Neuropsychology; 19.183, Biological Bases of Motivation, or 19.186, Comparative Psychology and Ethology; two psychology electives; 19.162, Sensation and Perception Laboratory; 19.181, Laboratory in Physiological Psychology; two additional psychology laboratories; 19.274, Seminar in Sensory and Physiological Psychology; and one Directed Study or Honors Research, from 19.290 to 19.299 (see note 5).

Minor in Psychology

General Requirements: 19.105, Foundations of Psychology I; 19.106, Foundations of Psychology II; 19.120, Statistics in Behavioral Science I; and 19.121, Statistics in Behavioral Science II.

Students choose either General Psychology or one of four areas of concentration: Language and Cognition; Learning and Behavior Analysis; Personality and Social Psychology; or Sensory and Neuropsychology.

The additional courses required for each concentration follow:

General Psychology: 19.130, Social Psychology I, or 19.135, Personality; 19.149, Sensation, or 19.150, Perception; 19.155, Language and Cognition; 19.164, Learning and Motivation I; 19.178, Physiological Bases of Psychology I; and one psychology laboratory.

Language and Cognition: 19.155, Language and Cognition; 19.196, American Sign Language I; 19.151, Bilingualism; 19.152, Introduction to Phonetics; 19.156, Thought Processes in Children, or 19.157, Cognition; and 19.195, Laboratory in Psycholinguistics.

Learning and Behavior Analysis: 19.141, Human Behavioral Development I; 19.164, Learning and Motivation I; 19.149, Sensation; 19.168, Behavior Change in Institutions; one of the PSI Teaching Practica, 19.250-19.268 (even numbered); and 19.165, Learning and Motivation Laboratory.

Personality and Social Psychology: 19.130, Social Psychology; 19.135, Personality I; 19.136, Personality II; 19.202, Abnormal Psychology I; 19.203, Abnormal Psychology II; and 19.133, Laboratory in Social Psychology, or 19.138, Laboratory in Personality.

Sensory and Neuropsychology: 19.149, Sensation; 19.150, Perception; 19.178, Physiological Bases of Psychology I; 19.179, Physiological Bases of Psychology II, or 19.180, Neuropsychology; 19.183, Biological Bases of Motivation, or 19.186, Comparative Psychology and Ethology; and 19.162, Sensation and Perception Laboratory, or 19.181, Laboratory in Physiological Psychology.

Notes:

1. All freshman enrolled in the College of Arts and Sciences must complete two quarters of Freshman English, one quarter of a college-level mathematics course, and two additional quarters from each of the areas of Humanities, Social Sciences, and Science. Courses taken to fulfill the freshman requirements may also be credited toward the Arts and Sciences distribution requirements for B.A. majors, as well as to relevant psychology major or minor requirements.
2. Courses in the Topics in Psychology Series (TIPS) will not be considered psychology electives, but will be considered free electives.
3. Whichever of these two courses was *not* taken to fulfill the basic psychology course requirement.
4. Credit for this course will be counted toward the psychology major only if the entire concentration is completed. If students change concentrations or decide to enroll in the General Psychology program, this course will be considered a free elective.
5. Students should arrange, well in advance of registration, for Directed Study or Honors Research with a faculty member whose laboratory focuses on the concentration area. For assistance in selecting potential sponsors, consult your adviser early in the preceding quarter.

Sociology-Anthropology Concentration in Sociology

Bachelor of Arts

Preparatory Requirements: 21.100, Introduction to Sociology, and 20.100, Introduction to Anthropology. *Core Requirements:* 21.139, Introduction to Statistical Analysis; 21.240, 21.241, Research Methods I and II; 21.280, Classical Social Thought; 21.181, Current Social Thought; 21.270, Class, Power, and Social Change (preferably in senior year). *Elective Requirements:* two intermediate courses (100 level); two advanced courses (200 level); one anthropology course beyond 20.100.

Six electives in the social sciences other than sociology-anthropology.

Foreign language and distribution requirements.

Bachelor of Science

Preparatory Requirements: 21.100, Introduction to Sociology, and 20.100, Introduction to Anthropology. *Core Requirements:* 21.239, Introduction to Statistical Analysis; 21.240, 21.241, Research Methods I and II; 21.280, Classical Social Thought; 21.281, Current Social Thought; 21.270, Class, Power, and Social Change (preferably in senior year). *Elective Requirements:* two intermediate courses (100 level); two advanced courses (200 level); one anthropology course beyond 20.100.

Six electives in the social sciences other than sociology-anthropology.

Approved six-course specialization.

Minor in Sociology

Requirements: 21.100, Introduction to Sociology; any two courses from among the following: 21.240, Research Methods I; 21.241, Research Methods II; 21.280, Classical Social Thought; 21.281, Current Social thought; and any three-course specialization in sociology arranged between the student and adviser.

Concentration in Anthropology

Bachelor of Arts

Preparatory Requirements: 20.100, Introduction to Anthropology, and 21.100, Introduction to Sociology. *Core Requirements:* at least three of the following: 20.130, Language and Culture; 20.135, Individual and Culture; 20.240, Human Origins; 20.160, Sex, Sex Roles, and Family; 20.170, Culture in Transition; 20.210, Tribal Society and Cultures; 20.214, Peasant Society and Culture; 20.257, Myth and Religion. *Elective Requirements:* at least six additional anthropology courses; one sociology elective.

Six electives in the social sciences other than sociology-anthropology. Foreign language and distribution requirements.

Bachelor of Science

Preparatory Requirements: 20.100, Introduction to Anthropology, and 21.100, Introduction to Sociology. *Core Requirements:* at least three of the following: 20.130, Language and Culture; 20.135, Individual and Culture; 20.240, Human Origins; 20.160, Sex, Sex Roles, and Family; 20.170, Culture in Transition; 20.210, Tribal Society and Cultures; 20.214, Peasant Society and Culture; 20.257, Myth and Religion. *Elective Requirements:* at least six additional anthropology courses; one sociology elective.

Six electives in the social sciences other than sociology-anthropology. Approved five-course specialization.

Minor in Anthropology

Requirements: 20.100, Introduction to Social Anthropology; 20.130, Language and Culture; 20.135, Individual and Culture; 20.160, Sex, Sex Roles, and Family; and any two-course specialization in anthropology arranged between the student and adviser.

Speech Communication

Concentration in Group and Public Communication

Bachelor of Arts

Required Courses: 37.115, Introduction to Communication Skills; 37.131, Introduction to Communication Theory; 37.239, Argumentation and Debate, or 37.238, Group Discussion; 37.230, Interpersonal Communication I; 37.236, Theories of Persuasion, or 37.240, Contemporary Public Address; eight speech communication electives; 22.110, Introduction to Politics, or 22.111, Introduction to American Government; 19.106, Foundations of Psychology II, or 21.100, Introduction to Sociology; 19.130, Social Psychology, or 21.107, Social Psychology.

The College of Arts and Sciences foreign language and distribution requirements.

Bachelor of Science

Required Courses: 37.115, Introduction to Communication Skills; 37.131, Introduction to Communication Theory; 37.230, Interpersonal Communication I; 37.238, Group Discussion; 37.236, Theories of Persuasion; 37.237, Persuasive Techniques; 37.271, Introduction to Communication Research; six speech communication electives to be chosen from the following: 37.239, Argumentation and Debate; 37.116, Business and Professional Speaking; 37.150, The Mass and the Media; 37.240, Contemporary Public Address; 37.241, Theories of Audience Behavior; 37.270, Consultation Skills; 37.231, Interpersonal Communication II; 37.232, Female/Male Communication; 30.120, Introduction to Linguistics; 30.130, Introduction to Semantics; 26.150, Introduction to Logic. Also, eight social science credits beyond the introductory level,

selected in consultation with the student's adviser and based upon their value to the student's post-graduate activities.

College of Arts and Sciences distribution requirements; no language requirement.

Concentration in Personal Performance

Bachelor of Arts

Required Courses: 37.115, Introduction to Communication Skills; 37.110, Voice and Articulation; 37.111, Oral Interpretation; 37.116, Business and Professional Speaking; 37.239, Argumentation and Debate; 37.212, Advanced Vocal Techniques, or 37.214, Advanced Oral Interpretation; 37.290, Directed Study; six speech communication electives.

College of Arts and Sciences distribution and foreign language requirements.

Bachelor of Science

Required Courses: 37.115, Introduction to Communication Skills; 37.131, Introduction to Communication Theory; 37.110, Voice and Articulation; 37.111, Oral Interpretation; 37.290, Directed Study; eight speech communication electives selected from the following: 37.239, Argumentation and Debate; 37.116, Business and Professional Speaking; 37.212, Advanced Vocal Techniques; 37.214, Advanced Oral Interpretation; 37.236, Theories of Persuasion; 37.237, Persuasive Techniques; 37.238, Group Discussion; 37.244, Communication in Education; 37.150, The Mass and the Media; 37.240, Contemporary Public Address; 37.241, Theories of Audience Behavior; 37.270, Consultation Skills; 37.230, Interpersonal Communication I; 37.231, Interpersonal Communication II; 37.232, Female/Male Communication; 37.271, Introduction to Communication Research; 30.120, Introduction to Linguistics; 30.130, Introduction to Semantics; 26.150, Introduction to Logic. In addition, the student must complete not less than four courses taught outside the Department, selected in consultation with his/her adviser on the basis of their value to the student's proposed post-graduate activities and approved by the Speech Communication Curriculum Committee.

College of Arts and Sciences distribution requirements; no language requirement.

Boston-Bouv  College of Human Development Professions

Specimen Program in Health Education

First Year

Quarter 1					Quarter 2					Quarter 3				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
12.111	Gen. Chem.	3	3	4	12.112	Gen. Chem.	3	3	4	10.104	Fund. Math.	4		4
30.113	Fresh. Writ.	4		4	18.141	Bas. Ani. Bio.I	3	3	4	18.142	Bas. Ani. Bio.	3	4	4
50.114	Ed. & Soc. Sci.	4		4		Ed. Soc.				30.114	Intro. Lit.	4		4
65.131	Current Iss.					Elective			4	65.234	Hlth.Problems	4		4
	Hlth.	4		4	65.110	Fnd. Hlth. Ed.	2		2		PE Elective			2
65.208	First Aid	2	1	2	65.160	Instrct. Res.	2		2					
	PE Elective			1	65.209	Intro. Safety	2		2					

Second Year

Quarter 4					Quarter 5				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
19.105	Psych. I	4		4	19.106	Psych. II	4		4
50.121	Hum. Devel. I	4		4	50.131	Human Devel. II	4		4
62.250	Anat.-Phys.	3	2	4	62.251	Anat.-Phys.	3	2	4
	Gen. Stud.				65.116	Nutrition	4		4
	Elective	4		4					

Third Year

Quarter 6					Quarter 7			
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	Q.H.
18.120	Microbio.	3	4	4	50.141	Meas. & Eval.	4	4
51.135	Analysis of Tch.	4		4	65.222	Drug Use/Abuse	4	4
51.160	Pre-Practicum I.			1	65.225	Comm./Degen.		
65.114	Mental Hlth.	4		4		Diseases	4	4
	Require. Elect.	4		4		Gen. Stud.		
						Elective	4	4

Fourth Year

Quarter 8				Quarter 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
56.120	Intro. Spec. Ed.	4	4	65.140	Logvty. & Aging	4	4
65.217	Teach. Proced.	4	4	65.219	Comm. Hlth.	4	4
65.223	Hum. Sexuality	4	4	65.238	Seminar	2	2
	Gen. Stud.				Gen.Stud.		
	Elective	4	4		Elective	8	8
					Fnd. Ed. Elective	4	4

Fifth Year

Quarter 10				Quarter 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
65.240	Student Teach.		12	65.233	Org./Admin.		
	or				Hlth.Ed.	4	4
65.241	Field Exp.		12	65.235	Health Counseling	4	4
				65.239	Seminar	2	2
					Fnd. Ed. Elective	4	4

Specimen Program in Human Services

Quarter 1 22.111, Introduction to American Government; 30.113, Freshman Writing; 50.114, Education and Social Science; designated elective.

Quarter 2 30.114, Introduction to Literature; 50.166, The Human Services Professions; 50.161, Seminar in Group Process; designated elective.

Quarter 3 39.116, Principles and Problems of Economics; designated electives.

Bachelor of Science *Required Courses:* 30.113, Freshman Writing; 30.114, Introduction to Literature; 50.121, Human Development I; 50.131, Human Development and Learning II; 50.114, Education and Social Science; 22.111, Introduction to American Government; 39.116, Principles and Problems of Economics; 50.166, The Human Services Professions; 50.142, Introduction to Educational Statistics.

Core Courses: Either 19.135, Personality I, 19.136, Personality II, and 19.202, Abnormal Psychology, or 19.135, Personality I, 19.202, Abnormal Psychology I, and 19.203, Abnormal Psychology II; 50.167, Psychosocial Development; 50.161, Seminar in Group Process; 50.133, Educational Applications of Social Psychology; 21.157, Sociology of Human Service Organizations; 56.150, Introduction to Rehabilitation; 56.951, Principles of Medical Rehabilitation; one of the following: 21.145, Urban Society, or 21.245, Community Analysis, or 56.956, Community Planning in Rehabilitation; one of the following: 56.958, Social Welfare and Rehabilitation, or 21.125, Sociology of Private and Public Assistance, or 21.221, Seminar in Social Welfare; 53.804, Counseling Theory and Process.

Approved four-course concentration; two supervised field placements.

Courses in the areas of drama/speech and education humanities.

Distribution requirements.

Specimen Program in Physical Education

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
18.141	Bio. I	4	62.202	Life/Career Plan.*	3	10.104	Math.	4
30.113	Fresh. Writ.	4	18.142	Bio. II or		62.206	First Aid*	2
50.114	Soc. Sci.	4	12.106	Chem. or		65.131	Hlth. Issues	4
62.200	Hum. Movt.*	3	11.171	Physics	4	62.205	Grp. Dynamics*	3
62.13V	Gymnastics I	1	30.114	Intro. to Lit.	4	62.209	Hist./Phil. PE*	3
62.17J	Volleyball	1	50.121	Hum. Dev. I	4	62.16L	Track & Field	1
			62.13W/Y	Gymnastics II	1	62.10B	Swimming	3
			62.17C	Basketball	1			

Second Year

Quarter 4			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.
62.250	Anat.-Physiology I*	4	62.253	Kinesiology I*	4
62.220	Motor Dev.	4	50.131	Hum. Devel. II	4
62.216	Elem. School Act.or			Elective	4
62.219	Sec. School Act.	3		Elective	4
	Elective	4	62.14C	Tennis	1
62.12P	Rhythmic Analysis	1		Skill Elective	1
62.____	Skill Elective or				
62.15A	Movement Ed.	1			

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
62.263	Kinesiology II	4	62.251	Anat.-Physiology II*	4
50.142	Ed. Stat.	4	62.222	Motor Learn.*	4
19.149	Psych. Elective		62.260	Meas. and Eval.	4
or 105			62.217	Theory of Play or	
or 156			62.212	Theory of Coaching	2
or 157		4		TAC	2
62.276	Critical Teaching	4	62.16C	Condition. or	
	TAC	2	62.____	Skill Elective	1
62.14A	Badminton	1	62.____	Skill Elective	1

Fourth Year

Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.
62.254	Exer. Physiology I*	4	62.280	Curriculum Devel.	3
62.255	Adapted PE I	4	62.256	Bas. Athletic Trng.	3
	Elective	4		Elective	4
62.____	TAC	2		Elective	4
62.____	TAC	2		Elective	2
62.____	Skill Elective	1			

Note: For an area of concentration or option within the Physical Education Dept., other courses will be required as replacements for some courses listed above.
* Required Physical Education regardless of concentration.

Fifth Year

Quarter 10			Quarter 11		
No.	Course	Q.H.	No.	Course	Q.H.
62.282	Student Teaching	12	62.270	Admin.	4
				Elective	4
				Elective	4
				Elective	4

180 Q.H. = Minimum graduation requirement for Physical Education

185 Q.H. = Minimum graduation requirement for Athletic Training

Minimum of 24 Q.H. General Studies electives

Minimum of 9 Q.H. Boston-Bouv  College of Human Development Professions electives.

Specimen Program in Sport Communication (Nonteaching)**First Year**

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
18.141	Bio. I	4	62.202	Life/Career Plan.	3	10.104	Math.	4
30.113	Fresh. Writ.	4	18.142	Bio. II or		62.206	First Aid	2
50.114	Soc. Sci.	4	12.106	Chem. or		65.131	Current Iss. Hlth.	4
62.200	Hum. Movt.	3	11.171	Physics	4	62.205	Grp. Dynamics	3
62.13V	Gymnastics I	1	30.114	Intro. Lit.	4	62.209	Hist./Phil. PE	3
62.17J	Volleyball	1	50.121	Hum. Dev. I	4	62.16L	Track & Field	1
			62.17C	Basketball	1	62.10B	Swimming	1
			62.13W/Y	Gymnastics II	1			

Second Year

Quarter 4			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.
62.250	Anat.-Physiology I	4	62.253	Kinesiology I	4
62.220	Motor Dev.	4	50.131	Hum. Devel. II	4
38.103	Fund. Newswrit.	4		Elective	4
37.236	Theories Persuasion	4	38.104	Fund. Newswrit.	4
62.____	Team Skill Elective	1	62.____	Ind. or Dual Skill Elective	1

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
62.263	Kinesiology II	4	62.251	Anat.-Physiology II	4
50.142	Ed. Stat.	4	62.222	Motor Learn.	4
19.149	150, 156, 157, 165, or		38.106	Tech. Journalism	4
	164 Psych. Elective	4		Elective	4
38.105	Tech. Journalism	4			

Fourth Year

Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.
62.254	Exer. Physiology	4		Comm. Elective	4
62.255	Adapted PE I	4		Electives	6
	Elective	4	62.256	Basic Athletic Trng.	3
	Elective	4	62.217	Theory of Play	2
62.____	Coach/Officiate		62.212	Theory of Coaching	2
	Elective	2			

Fifth Year

Quarter 10			Quarter 11		
No.	Course	Q.H.	No.	Course	Q.H.
62.281	Practicum	12	62.270	Admin. of PE	4
			62.204	Psych. of Sport	2
			62.206	Soc. of Sport	2
				Elective	4
				Elective	4

180 Q.H. = Minimum graduation requirement for Physical Education Sport Communication

20 Q.H. = General Studies electives

9 Q.H. = Boston-Bouv  College of Human Development Professions electives

Note: Preregistration is essential for courses outside of the Physical Education Department.

Specimen Program in Recreation and Leisure Studies

First Year

Quarter 1				Quarter 2				Quarter 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
37.106	Fund. of Speech	3	3	30.114	Intro. Lit	4	4	65.131	Issues in Health	4	4
30.113	Fresh. Writ.	4	4	18.141	Ani. Bio. I	4(3)	4	18.142	Ani. Bio. II	4(3)	4
50.114	Ed. & Soc. Sci.	4	4	50.____	Soc. Sci. Elec.	4	4	50.____	Soc. Sci. Elec.	4	4
63.139	Life/Career Plan.	4	4	63.161	Found. Lead.			63.____	Prof. Skill		
63.124	Camp Leadership		2		Leis. Serv.	4	4		Cluster	4	4

Second Year

Quarter 4					Quarter 5				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
50.121	Hum. Devel. I	4		4	50.131	Hum. Devel. II	4		4
62.250	Anat. & Physio. I	3	2	4	62.251	Anat. & Physio. II	3	2	4
16.____	Earth Sci. Elec.	4		4	16.____	Earth Sci. Elec.	4		4
63.148	Intro. to Rec. & Leis.	3		3	63.____	Prof. Skill Cluster			4

Third Year

Quarter 6				Quarter 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
63.285	Intro. to Research	4	4	63.290	Research Seminar	4	4
63.____	Area of Concentration Course	4	4	63.165	Prog. Planning	4	4
63.____	Dept. Elective	4	4	63.____	Area of Concentration Course	4	4
	Guided Elective	3	4		Guided Elective		4

Fourth Year

Quarter 8				Quarter 9		
No.	Course	Cl.	Q.H.	No.	Course	Q.H.
63.250	Grp. Dynamics	3	3	63.280	Intern. Rec. & Leis. Serv.	16
63.279	Intern. Seminar	1	1			
63.____	Area of Concentration Course	4	4			
63.____	Area of Concentration Course	4	4			

Fifth Year**Quarter 10****Quarter 11**

No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
63.____	Area of Concen. Course	4	4	63.299	Sr. Seminar in Cont. Issues	4	4
63.____	Dept. Elective	3	4	63.____	Area of Concen. Course	4	4
	Guided Elective		4		Guided Elective		4
	Guided Elective		4		Guided Elective		4

Specimen Program in Physical Education/Cardiovascular Health and Exercise Specialist (Nonteaching Certification)

First Year**Quarter 1****Quarter 2****Quarter 3**

No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
18.141	Bio. I	4	62.202	Life/Career Plan.	3	10.104	Math.	4
30.113	Fresh Writ.	4	18.142	Bio. II	4	62.206	First Aid	2
50.114	Soc. Sci.	4	30.114	Intro. Lit.	4	65.131	Current Iss. Hlth.	4
62.200	Hum. Movt.	3	50.121	Hum. Dev. I	4	62.203	Grp. Dynamics	3
62.13V	Gymnastics I	1	62.13W/Y	Gymnastics II	1	62.210	Hist./Phil. PE	3
62.17J	Volleyball	1	62.17C	Basketball	1	62.16L	Track & Field	1
						62.10B	Swimming	1

Second Year**Quarter 4****Quarter 5**

No.	Course	Q.H.	No.	Course	Q.H.
62.250	Anat.-Physiology I	4	62.253	Kinesiology I	4
62.220	Motor Dev.	4	50.131	Hum. Devel. II	4
62.256	Bas. Athletic Trng.	3	19.105	Found. Psych.	4
12.106	Chem. I	4	12.107	Chem. II	4
62.12P	Rhythmics	1	62.14C	Tennis	1
	Skill Elective	1		Skill Elective	1

Third Year**Quarter 6****Quarter 7**

No.	Course	Q.H.	No.	Course	Q.H.
62.263	Kinesiology II	4	62.251	Anat.-Physiology II	4
50.142	Ed. Stat.	4	62.222	Motor Learn.	4
65.117	Pub. Hlth.	4	62.260	Meas. & Eval.	4
62.248	Clin. Athletic Trng.	2	62.16C	Phys. Condition.	1
62.14A	Badminton	1		Skill Elective	1
				Elective	4

Fourth Year**Quarter 8****Quarter 9**

No.	Course	Q.H.	No.	Course	Q.H.
62.254	Exer. Physiology	4	62.259	Exer. Testing/ Presc.	3
63.260	Admin. Rec. and Parks	4	62.865	Electrocardiography	2
63.262	Budg. Syst.	4	65.116	Nutrition	4
62.257	Adv. Athletic Trng.	4		Elective	4
62.16B	Weight Trng. Skill Elective	1		Skill Electives	2

Fifth Year**Quarter 10****Quarter 11**

No.	Course	Q.H.	No.	Course	Q.H.
62.281	Super. Field Experience	12	62.293	Spec. Prog. Elective	4
			65.225	Com. and Degen. Diseases	4
			62.235	Health Couns.	4

Specimen Program in Physical Education/Athletic Training Emphasis

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
18.141	Bio. I	4	18.142	Bio. II or		10.104	Math.	4
30.113	Fresh Writ.	4	12.106	Chem. or		62.206	First Aid	2
50.114	Soc. Sci.	4	11.171	Physics	4	65.131	Current Iss. Hlth.	4
62.200	Hum. Movt.	3	30.114	Intro. Lit.	4	62.209	Hist./Phil. PE	3
62.13V	Gymnastics I	1	62.202	Life/Career Plan.	3	62.205	Grp. Dynamics	3
62.17J	Volleyball	1	50.121	Hum. Dev. I	4	62.16L	Track & Field	1
			62.13W/Y	Gymnastics II	1	62.10B	Swimming	1
			62.17C	Basketball	1			

Second Year (Co-op starts)

Quarter 4			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.
62.250	Anat.-Physiology I	4	62.253	Kinesiology I	4
62.220	Motor Dev.	4	50.131	Hum. Devel. II	4
62.256	Bas. Athletic Trng.	3	62.221	Motor Devel.	4
	Elective (Chem./			Elective	4
	Physics/Bio. II)	4	62.14C	Tennis	1
62.12P	Rhythmics	1		Skill Elective	1
62.216	Elem. School Act. or				
62.219	Sec. School Act.	3			

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
62.263	Kinesiology II	4	62.251	Anat.-Physiology II	4
50.142	Ed. Stat.	4	62.222	Motor Learn.	4
	Elective	4	62.260	Meas. & Eval.	4
62.275	Critical Teaching	3	62.217	Theory of Play or	
62.248	Clin. Athletic Trng.	2	62.212	Theory of Coaching	2
62.14A	Badminton	1		TAC	2
			62.16C	Phys. Condition	1
				Skill Elective	1

Fourth Year

Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.
62.254	Exer. Physiology	4	62.280	Curriculum Devel.	3
62.255	Adapted PE I	4	65.116	Nutrition	4
62.257	Adv. Athletic Trng.	4		Elective	4
	Elective	4		TAC	2
	TAC	2		Elective	4

Fifth Year

Quarter 10			Quarter 11		
No.	Course	Q.H.	No.	Course	Q.H.
62.282	Super. Student		62.270	Admin. of PE	4
	Teaching			Elective	4
	Athletic Trng./			Elective	4
	Experience	12		Elective	4

180 Q.H. = Minimum graduation requirement for Physical Education

185 Q.H. = Minimum graduation requirement for Athletic Training

20 Q.H. = General Studies electives

10 Q.H. = Boston-Bouv  College of Human Development Professions electives

No.	Course	Cl.	Q.H.	No.	Course	Q.H.	No.	Course	Cl.	Q.H.
64.176	Admin.	3	3	64.194	Super. Clin. Ed.		64.173	Phys. Thrpy. In		
64.167	Research Design	3(2)	4					Hlth. Care Syst.	3	3
64.178	Phys. Thrpy. VIII	1(2)	2				64.182	Psychosoc. Asp.		
	Elective	4	4					of Illness	3	3
	Elective	4	4				64.239	Invest. Stud.	4(4)	6
								Elective	4	4

Department of Recreation and Leisure Studies

Areas of Concentration Required Courses

Quarter Offered

1. Therapeutic Recreation	
63.249 Process of Aging	6-8-10
63.162 Overview of Physical Disabilities	6-8-10
63.153 Social and Psychological Impacts of Disabilities	8-10
63.169 Program Planning in Therapeutic Recreation	8-10
63.156 Foundations of Psychological Services in Therapeutic Recreation	10-11
Plus thirteen quarter hours of guided department electives	
2. Recreation Management	
63.168 Budget Analysis	6-8-10
63.174 Elements of Outdoor Recreation Planning	6-8-10
63.260 Administration of Recreation and Parks	6-8-10
63.264 Program Evaluation	7-11
Plus sixteen quarter hours of guided department electives	
3. Outdoor Recreation/Environment Education	
63.128 Survey of Facilities	7-11
63.170 Interpretations of Economic & Social History	6-8-10
63.171 Environmental Education	7-8-11
63.172 Seminar on Environmental Issues and Legislation	6-8-10
63.174 Elements of Outdoor Recreation Planning	6-8-10
Plus thirteen quarter hours of guided department electives	

Specimen Programs in Teacher Preparation

General Requirements:

Students must complete the following requirements to earn a Bachelor of Science degree in Education:

1. Distribution requirements with a minimum of sixteen quarter hours in each one of these areas: humanities, mathematics/sciences, and social sciences.
2. Major course requirements as listed on pages 30-33. (In addition to those courses required of all Elementary Education majors, students in this major must take designated courses in one area of emphasis chosen from the following: humanities, early childhood education, social sciences, mathematics/sciences, language/reading, and special education.)
3. Designated electives offered by the College of Arts and Sciences and the Boston-Bouv  College of Human Development Professions. These electives, which depend on the particular program of study, are in the areas of English, history, drama/speech, political science, economics, earth science, and the foundations of education.

There is no language requirement.

As early as possible students should discuss their curriculum questions and academic needs with a representative of the Dean's Office or a faculty adviser.

Specimen Program in Early Childhood Education (K-3)

Freshman Year (48 Q.H.)

- 23.101 Western Civ. I
- 30.113 Freshman Composition
- 50.114 Education and Social Science
- 51.158 Education for the Future
- 16.____ Earth Science (Elective)
- 23.102 Western Civ. II
- 39.115 Economics
- 16.____ Earth Science (Elective)
- 22.____ Political Science (Elective)
- 50.162 Day Care and Nursery Schools
- 30.114 Introduction to Literature
- 30.____ English (Elective)

Middler Year (35 Q.H.)

- 51.123 Fundamentals of Reading I
- 51.154 Math/Science I
- 51.161 Pre-Practicum II (1 Q.H.)
- 51.152 Literature and Learning Materials
- 51.155 Math/Science II
- 51.134 Fundamentals of Reading II (6 Q.H.)
- 50.____ Educational Humanities Elective
- 22.____ Political Science Elective
- 23.____ History Elective

Senior Year (32 Q.H.)

- 51.138 Linguistics and Reading
- 55.131 Semantics and Syntax
- 51.151 Student Teaching (8 Q.H.)
- 23.____ History Elective
- Math/Science Elective
- Elective
- Elective

Sophomore Year (31 Q.H.)

- 51.135 Analysis of the Instructional Process
- 51.160 Pre-Practicum I (1 Q.H.)
- 50.121 Human Development I
- 56.120 Introduction to Special Education
- 62.191 Motor Skills Development (2 Q.H.)
- 55.122 Introduction to Speech and Hearing
- 50.132 Creative Expression in Children
- 30.____ English (Elective)
- Humanities Elective

Junior Year (36 Q.H.)

- 51.156 Elementary Education Curriculum I
- 51.162 Pre-Practicum III (1 Q.H.)
- 51.137 Remedial Reading
- 51.157 Elementary Education Curriculum II
- 50.141 Measurement and Evaluation
- 90.253 Professional Development (1 Q.H.)
- 50.136 Language and Cognition
- 50.139 Seminar in Early Childhood
- 51.150 Field Placement (2 Q.H.)
- 29.____ Drama or
- 37.____ Speech
- Math/Science Elective

182 Q.H. = Minimum graduation requirement

Specimen Program in Elementary Education (Humanities Emphasis)

Freshman Year (48 Q.H.)

- 23.101 Western Civ. I
- 30.113 Freshman Composition
- 50.114 Education and Social Science
- 51.158 Education for the Future
- 16.____ Earth Science (Elective)
- 23.102 Western Civ. II
- 39.115 Economics
- 16.____ Earth Science (Elective)
- 22.____ Political Science (Elective)
- 30.114 Introduction to Literature
- 30.____ English (Elective)
- 50.____ Educational Sociology Elective

Middler Year (35 Q.H.)

- 51.123 Fundamentals of Reading I
- 51.154 Math/Science I
- 51.161 Pre-Practicum II (1 Q.H.)
- 51.152 Literature and Learning Materials
- 51.155 Math/Science II
- 51.134 Fundamentals of Reading II (6 Q.H.)
- 50.____ Educational Humanities Elective
- 22.____ Political Science Elective
- Humanities Elective

Sophomore Year (33 Q.H.)

- 51.135 Analysis of the Instructional Process
- 51.160 Pre-Practicum I (1 Q.H.)
- 50.121 Human Development I
- 56.120 Introduction to Special Education
- 50.131 Human Development I
- 30.____ English (Elective)
- Humanities (Elective)
- 23.____ History Elective
- Elective

Junior Year (34 Q.H.)

- 51.156 Elementary Education Curriculum I
- 51.162 Pre-Practicum III (1 Q.H.)
- 51.157 Elementary Education Curriculum II
- 50.141 Measurement and Evaluation
- 90.253 Professional Development (1 Q.H.)
- 23.____ History Elective
- 29.____ Drama or
- 37.____ Speech
- Math/Science Elective
- Humanities Elective
- Humanities Elective

Senior Year (32 Q.H.)

- 51.151 Student Teaching (8 Q.H.)
 - Math/Science Elective
 - Humanities Elective
 - Humanities Elective
 - Humanities Elective
 - Elective
 - Elective

182 Q.H. = Minimum graduation requirement

**Specimen Program in Elementary Education
(Language/Reading Emphasis)**

Freshman Year (48 Q.H.)

- 23.101 Western Civ. I
- 30.113 Freshman Composition
- 50.114 Education and Social Science
- 51.158 Education for the Future
- 16.____ Earth Science Elective
- 23.102 Western Civ. II
- 39.115 Economics
- 16.____ Earth Science Elective
- 22.____ Political Science Elective
- 30.114 Introduction to Literature
- 3.____ English Elective
- 50.____ Educational Sociology Elective

Middler Year (35 Q.H.)

- 51.123 Fundamentals of Reading I
- 51.154 Math/Science I
- 51.161 Pre-Practicum I (1 Q.H.)
- 51.152 Literature and Learning Materials
- 51.155 Math/Science II
- 51.134 Fundamentals of Reading II (6 Q.H.)
- 50.____ Educational Humanities Elective
- 22.____ Political Science Elective
- Elective

Senior Year (32 Q.H.)

- 51.151 Student Teaching (8 Q.H.)
 - Language/Reading
 - Language/Reading
 - Math/Science Elective
 - Elective
 - Elective
 - Elective

182 Q.H. = Minimum graduation requirement

Sophomore Year (33 Q.H.)

- 51.135 Analysis of the Instructional Process
- 51.160 Pre-Practicum I (1 Q.H.)
- 50.121 Human Development I
- 56.120 Introduction to Special Education
- 50.131 Human Development II
- 30.____ English Elective
- Humanities Elective
- 23.____ History Elective
- Elective

Junior Year (34 Q.H.)

- 51.156 Elementary Education Curriculum I
- 51.162 Pre-Practicum III (1 Q.H.)
- 51.157 Elementary Education Curriculum II
- 50.141 Measurement and Evaluation
- 90.253 Professional Development (1 Q.H.)
- 23.____ History Elective
- 29.____ Drama or
- 37.____ Speech
- 51.137 Remedial Reading
- 51.138 Linguistics and Reading
- Math/Science Elective

Specimen Program in Elementary Education (Social Sciences Emphasis)

Freshman Year (48 Q.H.)

- 23.101 Western Civ. I
- 30.113 Freshman Composition
- 50.114 Education and Social Science
- 51.158 Education for the Future
- 16.____ Earth Science Elective
- 23.102 Western Civ. II
- 39.115 Economics
- 16.____ Earth Science Elective
- 22.____ Political Science Elective
- 30.114 Introduction to Literature
- 30.____ English Elective
- 50.____ Educational Sociology Elective

Middler Year (35 Q.H.)

- 51.123 Fundamentals of Reading I
- 51.154 Math/Science I
- 51.161 Pre-Practicum II (1 Q.H.)
- 51.152 Literature and Learning Materials
- 51.155 Math/Science II
- 51.134 Fundamentals of Reading II (6 Q.H.)
- 50.____ Educational Humanities Elective
- 22.____ Political Science Elective
- Social Science Elective

Senior Year (32 Q.H.)

- 51.151 Student Teaching (8 Q.H.)
- Math/Science Elective
- Social Science Elective
- Elective
- Elective
- Elective

182 Q.H. = Minimum graduation requirement

Sophomore Year (33 Q.H.)

- 51.135 Analysis of the Instructional Process
- 51.160 Pre-Practicum I (1 Q.H.)
- 50.121 Human Development I
- 56.120 Introduction to Special Education
- 50.131 Human Development II
- 30.____ English Elective
- Humanities Elective
- 23.____ History Elective
- Elective

Junior Year (34 Q.H.)

- 51.156 Elementary Education Curriculum I
- 51.162 Pre-Practicum III (1 Q.H.)
- 51.157 Elementary Education Curriculum II
- 50.141 Measurement and Evaluation
- 90.253 Professional Development (1 Q.H.)
- 23.____ History Elective
- 29.____ Drama or
- 37.____ Speech
- Math/Science Elective
- Social Science Elective
- Social Science Elective

Specimen Program in Elementary Education (Special Education Emphasis)

Freshman Year (48 Q.H.)

- 23.101 Western Civ. I
- 30.113 Freshman Composition
- 50.114 Education and Social Science
- 51.158 Education for the Future
- 16.____ Earth Science Elective
- 23.102 Western Civ. II
- 39.115 Economics
- 16.____ Earth Science Elective
- 22.____ Political Science Elective
- 30.114 Introduction to Literature
- 30.____ English Elective
- 50.____ Educational Sociology Elective

Middler Year (35 Q.H.)

- 51.123 Fundamentals of Reading I
- 51.154 Math/Science I
- 51.161 Pre-Practicum II (1 Q.H.)
- 51.152 Literature and Learning Material
- 51.155 Math/Science II
- 51.134 Fundamentals of Reading II (6 Q.H.)
- 50.____ Educational Humanities Elective
- 22.____ Political Science Elective
- 19.202 Psychology of Abnormal Behavior

Sophomore Year (33 Q.H.)

- 51.135 Analysis of the Instructional Process
- 51.160 Pre-Practicum I (1 Q.H.)
- 50.121 Human Development I
- 56.120 Introduction to Special Education
- 50.131 Human Development II
- 30.____ English Elective
- 55.122 Introduction to Speech and Hearing
- Humanities Elective
- 23.____ History Elective

Junior Year (34 Q.H.)

- 51.156 Elementary Education Curriculum I
- 51.162 Pre-Practicum III (1 Q.H.)
- 51.157 Elementary Education Curriculum II
- 50.141 Measurement and Evaluation
- 90.253 Professional Development (1 Q.H.)
- 23.____ History Elective
- 29.____ Drama or
- 37.____ Speech
- 56.121 Introduction to Learning Disabilities
- 56.140 Psychology of the Mentally Retarded
- 56.130 Introduction to the Emotionally
- Disturbed

Senior Year (32 Q.H.)

- 51.151 Student Teaching (8 Q.H.)
- 56.150 Introduction to Rehabilitation
- 56.124 Diagnostics in Special Education
- 56.135 Socio-Psycho Dynamics of Family Life
- 56.126 Methods and Materials of Special Education
- Math/Science Elective
- Math/Science Elective

182 Q.H. = Minimum graduation requirement

Specimen Program in Speech and Hearing

First Year			Second Year		
Quarter 1		Q.H.	Quarter 4		Q.H.
30.113	English	4	50.142	Intro. Ed. Stat.	4
50.114	Ed. & Soc. Sci.	4	55.125	Hearing Sci.	4
18.116	Hum. Orgnsm.	4	56.120	Intro. Spec. Ed.	4
	Elective*	4		Elective*	4
Quarter 2		Q.H.	Quarter 5		Q.H.
30.113	English	4	50.121	Hum. Dev. I	4
55.159	Bas. Man. Comm.	4	55.126	Anat. Voc. Mech.	4
	Elective*	4		Elective*	4
	Elective*	4		Elective*	4
Quarter 3		Q.H.			
55.122	Intro. Speech	4			
	Elective*	4			
	Elective*	4			
	Elective*	4			
Third Year			Fourth Year		
Quarter 6		Q.H.	Quarter 8		Q.H.
55.133	Dev. Phonology	4	55.123	Speech Sci.	4
19.135	Personality I	4	51.133	Fund. Read. I	4
55.131	Dev. Semantics	4	55.154	Fluency Dis.	4
	Elective*	4	90.253	Prof. Dev.	4
Quarter 7		Q.H.	Quarter 9		Q.H.
19.136	Personality II	4	55.143	Diagnostic Tech.	4
55.141	Phonemic Dis.	4	55.144	Orient. Clin. Prac.	4
55.142	Intro. Audiology	4	55.127	Intro. Psychoacoustics	1
	Elective*	4		Elective*	4
Fifth Year					
Quarter 10		Q.H.			
19.202	Abn. Psych. I	4			
55.128	Psychoacoustics Lab.	4			
	Elective*	4			
Quarter 10a		Q.H.			
55.155	Clin. Prac	8			
Quarter 11		Q.H.			
19.203	Psych. II	4			
	Elective*	4			

*Electives must include: 8 Q.H. in Ed. Soc.; 4 Q.H. in Ed. Psych.; 16 Q.H. in Lib. Arts Humanities; 4 Q.H. in Lib. Arts Soc. Sci.; 4 Q.H. in Ed.; and 8 Q.H. in Lib. Arts Math/Sci.

177 Q.H. = Minimum graduation requirement.

College of Business Administration

Specimen Program for First Three Quarters

The courses taken in the first three quarters are the same for all concentrations.

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
41.111	Acct. Prin. I	4	41.112	Acct. Prin. II	4	49.100	Intro. Bus.	4
10.119	Fund. of Math.	4	49.249	Intro. Quan.	4	30.114	Intro. Lit.	4
30.113	Fresh. Writ.	4		Meth. in Bus.	4	39.106	Prin. of Econ. (Micro)	4
	Nonbus. Elective	4	39.105	Prin. of Econ. (Macro)	4		Nonbus. Elective	4
				Nonbus. Elective	4			

Accounting

- Quarter 4** 49.250, Business Statistics I; 49.205, Introduction to Data Processing; two arts and sciences electives.
- Quarter 5** 49.251, Business Statistics II; three arts and sciences electives.
- Quarter 6** 41.251, Intermediate Accounting I; 45.209, Organizational Behavior; 43.120, Introduction to Marketing; one arts and sciences elective.
- Quarter 7** 41.252, Intermediate Accounting II; 41.253, Cost Accounting I; 45.210, Complex Organizations; 44.120, Introduction to Finance.
- Quarter 8** 41.254, Cost Accounting II; 41.255, Intermediate Accounting III; arts and sciences elective; open elective.
- Quarter 9** 45.250, Business and Society; 41.262, Accounting Theory and Practice, or 41.263, Accounting Planning and Control; 45.265, Operations Management; open elective.
- Quarter 10** 45.112, Business Policy; two open electives; non-accounting elective.
- Quarter 11** Two open electives; non-accounting elective; arts and sciences elective.

Entrepreneurship and New Venture Management

- Quarter 4** 49.250, Business Statistics I; 49.205, Introduction to Data Processing; two arts and sciences electives.
- Quarter 5** 49.251, Business Statistics II; three arts and sciences electives.
- Quarter 6** 45.209, Organizational Behavior; 45.212, New Venture Creation; 43.120, Introduction to Marketing; open elective.
- Quarter 7** 45.210, Complex Organizations; 44.120, Introduction to Finance; two open electives.
- Quarter 8** 45.130, Operations Analysis and Venture Capital; arts and sciences electives; open elective.
- Quarter 9** 44.159, Small Business Finance; 45.250, Business and Society; 45.265, Operations Management; open elective.
- Quarter 10** 45.112, Business Policy; 49.107, Small Business Management; arts and sciences elective; open elective.
- Quarter 11** 45.295, Small Business Institute Field Project; two open electives.

Finance and Insurance

- Quarter 4** 49.250, Business Statistics I; 49.205, Introduction to Data Processing; two arts and sciences electives.
- Quarter 5** 49.251, Business Statistics II; three arts and sciences electives.
- Quarter 6** 44.120, Introduction to Finance; 44.275, Money and Business Activity; 45.209, Organizational Behavior; arts and sciences elective.
- Quarter 7** 44.154, Managerial Finance; 43.120, Introduction to Marketing; 45.210, Complex Organizations; arts and sciences elective.

Quarter 8	44.181, Investment Management; finance elective; business elective; open elective.
Quarter 9	45.250, Business and Society; finance elective; 45.265, Operations Management; open elective.
Quarter 10	45.112, Business Policy; finance elective; two open electives.
Quarter 11	All open electives.

General Business Administration

Quarter 4	49.250, Business Statistics I; 49.205, Introduction to Data Processing; two arts and sciences electives.
Quarter 5	49.251, Business Statistics II; three arts and sciences electives.
Quarter 6	45.209, Organizational Behavior; 44.120, Introduction to Finance; business elective; open elective.
Quarter 7	45.210, Complex Organizations; 43.120, Introduction to Marketing; business elective; open elective.
Quarter 8	Arts and sciences elective; two business electives; open elective.
Quarter 9	45.250, Business and Society; arts and sciences elective; 45.265, Operations Management; open elective.
Quarter 10	45.112, Business Policy; arts and sciences elective; business elective; open elective.
Quarter 11	Business elective; three open electives.

Human Resources Management

Quarter 4	49.250, Business Statistics I; 49.205, Introduction to Data Processing; two arts and sciences electives.
Quarter 5	49.251, Business Statistics II; three arts and sciences electives.
Quarter 6	45.209, Organizational Behavior; 43.120, Introduction to Marketing; two open electives.
Quarter 7	45.210, Complex Organizations; 45.272, People and Productivity; 44.120, Introduction to Finance; open elective.
Quarter 8	45.273, Personnel Administration; 45.277, Reward Systems; arts and sciences elective; open elective.
Quarter 9	45.250, Business and Society; open elective; 45.265, Operations Management; Human Resources Management elective.
Quarter 10	45.274, Contemporary Labor Issues; Human Resources Management elective; 45.112, Business Policy; arts and sciences elective.
Quarter 11	Arts and sciences elective; three open electives.

International Business Administration

Quarter 4	49.250, Business Statistics I; 49.205, Introduction to Data Processing; two arts and sciences electives.
Quarter 5	49.251, Business Statistics II; three arts and sciences electives.
Quarter 6	45.209, Organizational Behavior; 46.100, Introduction to International Business; 44.120, Introduction to Finance; open elective.
Quarter 7	45.210, Complex Organizations; 43.120, Introduction to Marketing; business elective; open elective.
Quarter 8	Liberal International elective; business elective; arts and sciences elective; open elective.
Quarter 9	45.250, Business and Society; 45.265, Operations Management; Business International elective; open elective.

Quarter 10	45.112, Business Policy; Arts and Sciences International elective; two open electives.
Quarter 11	46.101, Seminar in International Business; Business International elective; two open electives.

Note: A list of Arts and Sciences electives that count toward the International Business concentration and the scheduled offerings of the International Business electives are available for program planning. Students should consult this list and the schedule of offerings. Students should consider a dual concentration.

Management

Quarter 4	49.250, Business Statistics I; 49.205, Introduction to Data Processing; two arts and sciences electives.
Quarter 5	49.251, Business Statistics II; three arts and sciences electives.
Quarter 6	45.209, Organizational Behavior; 44.120, Introduction to Finance; open elective; business elective.
Quarter 7	45.210, Complex Organizations; 45.272, People and Productivity; Human Resources Management elective; 41.205, Cost Accounting for Management; 43.120, Introduction to Marketing.
Quarter 8	49.155, Legal Aspects of Business; business elective; arts and sciences elective; open elective.
Quarter 9	45.250, Business and Society; 45.265, Operations Management; arts and sciences elective; open elective.
Quarter 10	45.112, Business Policy; arts and sciences elective; two open electives.
Quarter 11	Three open electives; business elective.

Marketing

Quarter 4	49.250, Business Statistics I; 49.205, Introduction to Data Processing; two arts and sciences electives.
Quarter 5	49.251, Business Statistics II; three arts and sciences electives.
Quarter 6	43.120, Introduction to Marketing; 45.209, Organizational Behavior; arts and sciences elective; open elective.
Quarter 7	43.252, Marketing Management; 45.210, Complex Organizations; 44.120, Introduction to Finance; open elective.
Quarter 8	43.240, Marketing Research; marketing elective; arts and sciences elective.
Quarter 9	45.250, Business and Society; marketing elective; 45.265, Operations Management; open elective.
Quarter 10	43.278, Competitive Strategy; 45.112, Business Policy; arts and sciences elective; open elective.
Quarter 11	Marketing elective; three open electives.

Transportation and Physical Distribution Management

Quarter 4	49.250, Business Statistics I; 49.205, Introduction to Data Processing; two arts and sciences electives.
Quarter 5	49.251, Business Statistics II; three arts and sciences electives.
Quarter 6	48.101, Principles of Transportation; 45.209, Organizational Behavior; 44.120, Introduction to Finance; open elective.
Quarter 7	45.210, Complex Organizations; 43.120, Introduction to Marketing; 48.104, Physical Distribution Management; open elective.
Quarter 8	Transportation elective; two arts and sciences electives; open elective.
Quarter 9	45.250, Business and Society; 48.102, Current Issues in Transportation Policy; 45.265, Operations Management; open elective.

Quarter 10 45.112, Business Policy; transportation elective; arts and sciences elective; open elective.

Quarter 11 48.120, Seminar in Transportation; three open electives.

College of Computer Science

Specimen Program for Bachelor of Science in Computer Science

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
10.150	Calculus I	4	10.151	Calculus II	4	10.152	Calculus III	4
11.117	Physics I*	4	11.118	Physics II*	4	11.119	Physics III*	4
06.100	Comp. Sci. I	4	06.101	Comp. Sci. II	4		Soc. Sci./Hum.	4
30.113	English	4	30.114	English	4	09.140	Applied. Prog.	4
						06.110	Prog. Lang. Lab I	1

Second Year

Quarter 4			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.
10.153	Calculus IV	4	10.210	Discrete Math	4
06.130	Assembly Lang. I	4	06.131	Assembly Lang. II	4
06.201	Data Structures	4	03.191	Computer Org. & Des. I	4
	Soc. Sci./Hum.	4		Soc. Sci./Hum.	4
06.111	Prog. Lang. Lab II	1	06.112	Prog. Lang. Lab III	1

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
10.246	Linear Algebra	4	10.208	Probability [†]	4
06.220	File Processing	4	06.230	Operating Systems	4
03.192	Computer Org. & Des. II	4		Coordinated Study	4
	Coordinated Study	4		Soc. Sci./Hum.	4

Fourth Year

Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.
10.220	Statistics I [†]	4	06.260	Compiler Design I	4
06.240	Analysis of Prog. Lang.	4	06.265	Analysis of Algorithms	4
06.250	Automata & Formal Lang.	4		Coordinated Study	4
	Soc. Sci./Hum.	4		Soc. Sci./Hum.	4

Fifth Year

Quarter 10			Quarter 11		
No.	Course	Q.H.	No.	Course	Q.H.
	Comp. Sci. Elect. [‡]	4		Coordinated Study	4
	Coordinated Study	4		Coordinated Study	4
	Coordinated Study	4		Soc. Sci./Hum.	4
06.291	Computer Sci. Proj.	4	06.295	Computer Sci. Sem.	4

*Students interested in life science may be allowed to substitute 12.127-12.129 or 18.131-18.133 if schedule permits. 11.203, 11.204, 11.205 substituted for 11.117, 11.118, 11.119 for 1980-81 academic year.

[†]Students interested in the theoretical aspects of computer science should substitute 10.208 and 10.220.

[‡]06.280, Artificial Intelligence; 06.210, Computer Graphics; or 06.225, Data Base Management.

College of Criminal Justice

Specimen Program in Criminal Justice

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
92.104	Admin. Crim. Just.	4	39.116	Prin./Prob. Econ.	4	21.100	Intro. Soc.	4
39.115	Prin./Prob. Econ.	4	22.111	Intro. Amer. Gov.	4	19.106	Fnd. Psych. II	4
22.110	Intro. Politics	4	30.113	Fresh. Writ.	4	30.114	Intro. Lit.	4
19.105	Fnd. Psych. I	4		Crim. Jus. Elective	4		Crim. Jus. Elective	4

Second Year

Quarter 4			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.
22.141	State & Loc. Gov.	4		Math/Sci. Require.	4
92.141	Crim. Law	4		Non-Crim. Jus. Elective	4
92.137	Criminology	4			
	Math/Sci. Require.	4	92.____	Crim. Jus. Elective	4
			92.134	Constitutional Prob.	4

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
92.____	Crim. Jus. Elective	4	92.____	Crim. Jus. Elective	4
	Non-Crim. Justice Elective	4		Non-Crim. Jus. Elective	4
92.114	Crim. Jus. Research	4		Non-Crim. Jus. Elective	4
23.101	Western Civ. I	4	23.102	Western Civ. II	4

Fourth Year

Fifth Year

Quarters 8-11					
No.	Course	Q.H.	No.	Course	Q.H.
92.____	Crim. Jus. Electives	24		Non-Crim. Jus. Electives	36

College of Engineering

Specimen Program in Chemical Engineering

All courses in Chemical Engineering must be taken in sequence shown.

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
10.150	Calculus I	4	10.151	Calculus II	4	10.152	Calculus III	4
11.203	Physics I	4	11.204	Physics II	4	11.205	Physics III	4
09.108	Comp. for Eng.	4	09.109	Engr. Graph. and Des.	4	12.115	Gen. Chem.	4
30.114	Intro. Lit.	4	12.114	Gen. Chem.	4	30.115	Gr. Th. Lit.	4

First-year pattern of two-term courses may vary according to assigned section.

Quarters 4, 6, 8, and 10 offered Fall and Winter.

Quarters 5, 7, and 9 offered Spring and Summer.

Second Year

Quarter 4			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.
10.153	Calculus IV	4	10.154	Calculus V	4
11.206	Physics IV	4	04.102	Chem. Engr. Cal. II	4
04.101	Chem. Engr. Cal. I	4	04.106	Poly. Sci. and Engr.	4
12.147	Organic Chem. I	4	12.148	Organic Chem. II	4
11.110	Physics Lab I	1	11.111	Physics Lab II	1

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
10.155	Math. Analysis I	4	10.156	Math. Analysis II	4
04.111	Chem. Engr. I	4	04.112	Chem. Engr. II	4
12.161	Phys. Chem. I	4	12.162	Phys. Chem. II	4
39.115	Economics I	4	39.116	Economics II	4

Fourth Year

Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.
04.121	Trans. Phen. I	4	04.122	Trans. Phen. II	4
04.123	Exp. Methods I	4	04.124	Exp. Methods II	4
04.126	Chem. Engr. Therm.	4	04.136	Chem. Engr. Kinet.	4
	Soc. Sci./ Hum. Elective	4		Soc. Sci./ Hum. Elective	4

Fifth Year

Quarter 10*			Quarter 11*		
No.	Course	Q.H.	No.	Course	Q.H.
04.131	Proc. Des. I	6	04.132	Proc. Des. II	6
04.133	Projects I	6	04.134	Projects II	6
04.____	Chem. Engr. Elective	4	04.____	Chem. Engr. Elective	4
04.____	Chem. Engr. Elective	4	04.____	Chem. Engr. Elective	4
	Soc. Sci./ Hum. Elective	4		Soc. Sci./ Hum. Elective	4

* Quarters 10 and 11 must be approved by department adviser.

Specimen Program in Civil Engineering

First Year

Quarter 1				Quarter 2				Quarter 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
09.108	Comp. for Engr.	3	4	09.109	Engr. Graph. and Des.	3	4	10.152	Calculus III	3	4
10.150	Calculus I	3	4					11.205	Physics III	3	4
11.203	Physics I	3	4	10.151	Calculus II	3	4	12.115	Gen. Chem.	3	4
30.114	Intro. Lit.	3	4	11.204	Physics II	3	4	30.115	Gr. Th. Lit.	3	4
				12.114	Gen. Chem.	3	4				

Second Year

Quarter 4				Quarter 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
11.110	Physics Lab I	0(3)	1	02.130	Therm. I	3	4
10.153	Calculus IV	3	4	11.111	Physics Lab II	0(3)	1
11.206	Physics IV	3	4	10.154	Calculus V	3	4
39.115	Economics I	3	4	39.118	Economics II	3	4
01.116	Engr. Meas.	3	4	01.140	Struct. Mech. I	3	4
01.117	Engr. Meas.	0(3)	2	01.116	Engr. Meas.	3	4
01.140	Struct. Mech. I	3	4	01.117	Engr. Meas. Lab	0(3)	2

01.116, 01.117 offered Fall and Summer quarters.
01.140 offered Winter and Spring quarters.

Third Year

Quarter 6				Quarter 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
10.155	Math. Anal. I	3	4	10.156	Math. Analysis II	3	4
02.116	Dynamics	3	4	01.180	Materials	3	4
01.141	Struct. Mech. II	3	4	01.120	Fluid Mech. I	3	4
	Soc. Sci./			37.109	Effect. Speaking	2	2
	Hum. Elec.	3	4	01.143	Struct. Analysis I	3	4

Fourth Year

Quarter 8				Quarter 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
03.183	Elec. Engr. I	3	4	01.193	Environ. Engr. I	3	4
01.178	Soil Mech.*	3	4	01.150	Concrete Des. I* or	3	4
01.179	Soil Mech. Lab*	0(3)	2	01.178	Soil Mech.	3	4
	or			01.179	Soil Mech. Lab	(3)	2
01.150	Concrete Des. I*	3	4		Tech. Elective		4
	Tech. Elective	3	4		Soc. Sci. Hum.		
	Soc. Sci./				Elective		4
	Hum. Elec.						

Fifth Year

Quarter 10				Quarter 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
01.160	Struct. Des.	3	4		Gen. Elective†	3	4
	Soc. Sci./				Tech. Elective	3	4
	Hum. Elec.	3	4		Tech. Elective	3	4
	Tech. Elective	3	4		Tech. Elective	3	4
	Tech. Elective	3	4				

*In Quarter 8 one-half of the class takes 01.150, the other 01.178 and 01.179; in Quarter 9 the sections are reversed.

†This may be a technical or arts and sciences elective or any other course given at the University. The general elective may be interchanged with an arts and sciences elective in another quarter, with the approval of the Civil Engineering Department.

Technical Electives

Fall-Winter
Quarters 8 & 10

No.	Course	Cl.	Q.H.
01.101	Special Topics		4
01.102	Special Topics		4
01.122	Hydraulic Engr.*	3	4
01.142	Struct. Mech. III†	3	4
01.152	Concrete Des. II†	3	4
01.175	Geotechnology	3	4
01.194	Environ. Engr. II*	3	4
01.206	App. Probability†	3	4
01.244	Struct. Analysis†	3	4
05.245	Bas. Engr. Statistics	3	4
05.260	Engr. Economy†	3	4

Spring
Quarters 9 & 11

No.	Course	Cl.	Q.H.
01.101	Special Topics		4
01.102	Special Topics		4
01.105	C.V. Engr. Sys.	3	4
01.135	Constr. Engr.	3	4
01.136	Highway Engr.	3	4
01.161	Struct. Des. II†	3	4
01.174	Found. Engr.†	3	4
01.195	Environ. Engr. III†	3	4
01.196	Environ. Des.*	3	4
01.207	Tech. Assess.	3	4
01.210	Legal Aspects	3	4
01.234	Transp. Engr.	3	4
01.245	Struct. Analysis III†	3	4
01.259	Air Pollution*	3	4
05.245	Engr. Statistics	3	4
05.260	Engr. Economy	3	4

*Required for Environmental Option

†Recommended for Structures Option

Note: During the summer the Civil Engineering Department offers a limited number of technical electives. Students should check with the Department for specific information. Technical electives from other engineering departments may be elected with the approval of the Civil Engineering Department Curriculum Committee.

Specimen Program in Electrical and Computer Engineering

First Year

Quarter 1				Quarter 2				Quarter 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
09.108	Comp. for Engr.	4	4	09.109	Engr. Graph. and Des.	4	4	10.152	Calculus III	4	4
10.150	Calculus I	4	4					11.205	Physics III	4	4
11.203	Physics I	4	4	10.151	Calculus II	4	4	12.115	Gen. Chem.	4	4
30.114	Intro. Lit.	4	4	11.204	Physics II	4	4	30.115	Gr. Th. Lit.	4	4
				12.114	Gen. Chem.	4	4				

Second Year

Quarter 4				Quarter 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
10.153	Calculus IV	4	4	10.154	Calculus V	4	4
11.206	Physics	4	4	02.163	Mech.	4	4
03.111	Circ. and Sys. I	4	4	03.112	Circ. and Sys. II	4	4
	Soc. Sci./ Hum. Elec.	4	4		Soc. Sci./ Hum. Elective	4	4
11.110	Physics Lab	0(3)	1	11.111	Physics Lab	0(3)	1
03.151	Elec. Engr. Lab I-A	0(4)	1	03.152	Elec. Engr. Lab I-B	0(4)	1

Third Year

Quarter 6				Quarter 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
10.155	Math. Anal. I	4	4	10.156	Math Analysis II	4	4
03.113	Circ. and Sys. III	4	4	03.122	Circ. and Sys. IV	4	4
03.101	Discrete Sys.	4	4	03.146	Electronics A	4	4
02.130	Therm. I	4	4	03.154	Elec. Engr. Lab II-B	0(4)	1
03.153	Elec. Engr. Lab II-A	0(4)	1		Soc. Sci./ Hum. Elective	4	4

Fourth Year

Quarter 8				Quarter 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
03.147	Electronics B	4	4	03.148	Electronics C	4	4
03.161	Electromag. Fid. Thry. I	4	4	03.162	Electromag. Fid. Thry. II	4	4
02.199	Material Sci. Soc. Sci./ Hum. Elec.	4	4	03.191	Intro. Dig. Comp. I	4	4
03.155	Elec. Engr. Lab III-A		1		Soc. Sci./ Hum. Elective	4	4
				03.156	Elec. Engr. Lab III-B	0(4)	1

Fifth Year**Quarter 10****Quarter 11**

No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
03.175	Electromech. Dynamics	4	4		Soc. Sci./ Hum. Elective	4	4
	Soc. Sci./ Hum. Elec.	4	4		Tech. Electives	8(12)	8(12)
	Tech. Elec.	4	4				
	Tech. Elec.	4	4				
03.134	Elec. Engr. Lab IV	0(4)	2				

Note: Seven arts and sciences electives (in either social sciences or humanities) are required for graduation. Two of these may be taken on a pass/fail basis in SEPARATE quarters. Also, four technical electives are required for graduation.

* Classes before 1982 took 09.106 and 09.107.

Specimen Program in Power Systems**First Year****Quarter 1****Quarter 2****Quarter 3**

No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
10.150	Calculus I	4	10.151	Calculus II	4	10.152	Calculus III	4
11.203	Physics I	4	11.204	Physics II	4	11.205	Physics III	4
09.108	Comp. For Engr.	4	09.109	Engr. Graph. and Des.	4	12.115	Gen. Chem.	4
30.114	Intro. Lit.	4	12.114	Gen. Chem. I	4	30.115	Gr. Th. Lit.	4

Second Year**Quarter 4****Quarter 5**

No.	Course	Q.H.	No.	Course	Q.H.
10.153	Calculus IV	4	10.154	Calculus V	4
11.206	Physics IV	4	02.163	Mech.	4
03.111	Circ. and Sys. I	4	03.112	Circ. and Sys. I	4
	Soc. Sci./ Hum. Elective	4		Soc. Sci./ Hum. Elective	4
03.151	Elec. Engr. Lab I-A	1	03.152	Elec. Engr. Lab I-B	1
11.110	Physics Lab I	1	11.111	Physics Lab II	1

Third Year**Quarter 6****Quarter 7**

No.	Course	Q.H.	No.	Course	Q.H.
10.155	Math. Analysis I	4	10.156	Math. Analysis II	4
02.130	Therm. I	4	03.122	Circ. and Sys. IV	4
03.113	Circ. and Sys. III	4	03.146	Electronics A	4
03.101	Discrete Sys.	4		Soc. Sci./ Hum. Elective	4
03.153	Elec. Engr. Lab II-A	1	03.154	Elec. Engr. Lab II-B	1

Quarters 4 and 6 offered Fall and Winter.

Quarters 5 and 7 offered Spring and Summer.

Fourth Year**Quarter 8 (Fall Only)****Quarter 9 (Spring Only)**

No.	Course	Q.H.	No.	Course	Q.H.
02.131	Therm. II	4	03.162	Electromag. Fid.	4
03.147	Electronics B	4		Thry. II	4
03.161	Electromag. Fid.	4	03.022	Elec. Power Sys. II	4
	Thry. I	4	03.148	Electronics C	4
03.221	Elec. Pwr. Sys. I	4		Soc. Sci./ Hum. Elective	4
03.115	Elec. Engr. Lab III-A		03.246	Elec. Engr. Pwr. Lab I	1

Fifth Year

Quarter 10 (Winter Only)			Quarter 11 (Spring Only)		
No.	Course	Q.H.	No.	Course	Q.H.
02.236	Nuclear Engr.	4	03.191	Intro. Dig. Comp.	4
03.176	Mach. and Sys.	4	03.176	Mach. and Sys.	4
03.178	Transients in Elec. Pwr. Sys.	4		A. & S. Elective	4
	Soc. Sci./Hum. Elective	4		Tech. Elective*	4
03.234	Elec. Engr. Pwr. Lab II	2			

*In Quarter 11, only one tehcnical elective is required for graduation.

Specimen Program in General Engineering

First Year

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
10.150	Calculus I	4	10.151	Calculus II	4	10.152	Calculus III	4
11.203	Physics I	4	11.204	Physics II	4	11.205	Physics III	4
09.108	Comp. for Engr.	4	09.109	Engr. Graph. and Des.	4	30.115	Gr. Th. Lit.	4
30.114	Intro. Lit.	4		Soc. Sci./Hum. Elective	4		Soc. Sci./Hum. Elective	4

Second Year

Quarter 4			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.
10.153	Calculus IV	4	10.154	Calculus V	4
11.206	Physics IV	4		Engr. Sci. Elective	4
	Engr. Sci. Elective	4		Coord. Study	
	Soc. Sci./Hum. Elective	4		Elective	4
11.110	Physics Lab I	1		Soc. Sci./Hum. Elective	4
			11.111	Physics Lab II	1

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
	Engr. Sci. Elective	4		Engr. Sci. Elective	4
	Coord. Study			Engr. Sci. Elective	4
	Elective	4		Coord. Study	
	Coord. Study			Elective	4
	Elective	4		Soc. Sci./Hum. Elective	4
	Soc. Sci./Hum. Elective	4			

Fourth Year

Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.
	Engr. Sci. Elective	4		Engr. Sci. Elective	4
	Engr. Sci. Elective	4		Engr. Sci. Elective	4
	Coord. Study			Coord. Study	
	Elective*	4		Elective	4
	Coord. Study			Coord. Study	
	Elective	4		Elective	4

Fifth Year

Quarter 10			Quarter 11		
No.	Course	Q.H.	No.	Course	Q.H.
	Engr. Sci. Elective	4		Engr. Sci. Elective	4
	Engr. Sci. Elective	4		Coord. Study	
	Coord. Study			Elective	4
	Elective	4		Coord. Study	
	Coord. Study			Elective	4
	Elective	4		Coord. Study	
				Elective	4

Note: Quarters 4, 6, 8, and 10 offered Fall and Winter; quarters 5, 7, and 9 offered Spring and Summer.

* Coordinated Study electives are courses chosen to meet the student's career objectives; these courses will be selected in conjunction with the student's adviser and are subject to the adviser's approval.

Specimen Program in Industrial Engineering**First Year**

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
10.150	Calculus I	4	10.151	Calculus II	4	10.152	Calculus III	4
11.203	Physics I	4	11.204	Physics II	4	11.205	Physics III	4
09.108	Comp. for Engr.*	4	09.109	Engr. Graph.		12.115	Gen. Chem.	4
30.114	Intro. Lit.	4		and Des.*	4	30.115	Gr. Th. Lit.	4
			12.114	Gen. Chem.	4			

* Class of 1981 took 09.106 and 09.107.

Second Year

Quarter 4				Quarter 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
05.128	Work Des.	3(3)	4	05.145	Probabilistic		
10.153	Calculus IV	4	4		Analysis	4	4
11.206	Physics IV	4	4	02.165	Mech.	4	4
39.115	Economics I	4	4	10.154	Calculus V	4	4
11.110	Physics Lab I	0(3)	1	39.116	Economics II	4	4
				11.111	Physics Lab II	0(3)	1

Third Year

Quarter 6				Quarter 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
05.201	Prin. of Comp.			05.148	Statistics II	4	4
	and Prog. I	4	4	05.181	Operations Res. I	4	4
03.183	Elec. Engr. I	4	4		Engr. Sci. Elective	4	4
	Math. Elective	4	4	05.150	Indus. Cost Cont.	4	4
05.147	Statistics I	4	4				

Fourth Year

Quarter 8				Quarter 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
05.130	Systems I	4	4	05.131	Systems II	4	4
05.240	Dig. Sim. Tech.	4	4	05.261	Engr. Econ. and		
05.163	Operations Res. II	4	4		Dec. Thry.	4	4
	Soc. Sci./				Engr. Sci. Elective	4	4
	Hum. Elec.	4	4		Soc. Sci./		
37.102	Effect. Speaking	3	3		Hum. Elective	4	4

Fifth Year

Quarter 10				Quarter 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
05.186	People in				Tech. Elective	4	4
	Organizations	4	4		Tech. Elective	4	4
	Tech. Elective	4	4		Open Elective	4	4
	Tech. Elective	4	4		Soc. Sci./		
	Soc. Sci./				Hum. Elective	4	4
	Hum. Elec.	4	4				

Specimen Program in Mechanical Engineering

First Year

Quarter 1				Quarter 2				Quarter 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
09.108	Comp. for Engr.*	4	4	09.109	Engr. Graph and Des.*	4	4	10.152	Calculus III	4	4
10.150	Calculus I	4	4					11.205	Physics III	4	4
11.203	Physics I	4	4	10.151	Calculus II	4	4	30.115	Gr. Th. Lit.*	4	4
30.114	Intro. Lit.*	4	4	11.204	Physics II	4	4	12.115	Gen. Chem.*	4	4
				12.114	Gen. Chem.*	4	4				

*First-year pattern of two-term courses may vary according to assigned section.

Second Year

Quarter 4				Quarter 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
02.165	Mech. I	4	4	02.167	Mech. III	4	4
10.153	Calculus IV	4	4	02.130	Therm. II	4	4
11.206	Physics IV	4	4	10.154	Calculus V	4	4
11.110	Physics Lab I	0(3)	1	11.111	Physics Lab II	0(3)	1
39.115	Prin. and Prob. of Econ.	4	4		Soc. Sci./ Hum. Elective	4	4

Third Year

Quarter 6				Quarter 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
02.131	Therm. II	4	4	02.155	Fluid Mech. I	4	4
02.166	Mech. II	4	4	02.196	Materials Sci.*	4(3)	5
02.192	Meas. and Analysis*	0(3)	4	10.156	Math. Analysis II	4	4
10.155	Math. Anal. I	4	4	02.168	Mech. IV	4	4

* Given in Quarters 6 and 7.

Fourth Year

Quarter 8				Quarter 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
	Tech. Elective	4	4	02.150	Heat Transfer I	4	4
	Tech. Elective	4	4	02.176	Dynamics	4	4
	Tech. Elective	4	4		Tech. Elective	4	4
	Soc. Sci./ Hum. Elec.	4	4		Soc. Sci./ Hum. Elective	4	4

Fifth Year

Quarter 10				Quarter 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
	Tech. Elective	4	4		Tech. Elective	4	4
	Tech. Elective	4	4		Tech. Elective	4	4
	Tech. Elective	4	4		Tech. Elective	4	4
	Soc. Sci./ Hum. Elec.	4	4		Soc. Sci./ Hum. Elective	4	4

Elective requirements for the junior and senior years (B.S. in M.E.)
Juniors and seniors will select ten (10) technical and four (4) arts and sciences electives, subject to the following Department restrictions:
A. Arts and Sciences electives (four):
Must be selected from a Department-approved list of humanities and/or social science courses, which is available during preregistration.
B. Required technical electives (three):
1. 03.183 Electrical Engineering I (Fall, Winter)
2. 02.197 Mechanical Behavior of Materials (Fall, Winter), or
02.198 Materials Processing (Spring, Summer)
3. 02.146 Mechanical Engineering Design (Spring - Prereq. 02.145 Fall, Winter), or
02.147 Engineering Design (Fall, Winter, Spring)
C. Additional technical electives (seven):
The remaining technical electives should be chosen after consideration of your professional career objectives and must be approved by your adviser during preregistration in the Department. The majority of these courses must be selected from the Mechanical Engineering elective course offerings. The student's area of concentration determines the recommended courses from which he or she is to choose electives.

Specimen B.S./M.S. Program in Mechanical Engineering

During the first two years of study, students enrolled in the B.S./M.E. Program In Mechanical Engineering pursue a curriculum similar to that of the regular M.E. Program.

Third Year

Quarter 6				Quarter 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
02.131	Therm. II	4	4	02.155	Fluid Mech.	4	4
02.166	Mech. III	4	4	02.196	Materials Sci.	4(3)	5
02.192	Meas. and Analysis	2(3)	4	02.168	Mech. IV	4	4
10.155	Math Analysis	4	4	10.156	Math Analysis	4	4
	Soc. Sci./				Soc. Sci./		
	Hum. Elective	4	4		Hum. Elective	4	4

Fourth Year

Quarter 8				Quarter 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
	Tech. Elective	4	4	02.150	Heat Transfer I	4	4
	Tech. Elective	4	4	02.176	Dynamics	4	4
	Tech. Elective	4	4		Tech. Elective	4	4
	Soc. Sci./				Soc. Sci./		
	Hum. Elective	4	4		Hum. Elective	4	4
	Grad. Elective	2	2		Grad. Elective	2	2
02.826	Math Methods I	2	2	02.827	Math. Methods II	2	2

Fifth Year

Quarter 10				Quarter 11				Quarter 12			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
	Grad. Elective	8	8		Grad. Elective	8	8		Thesis	6	6
	Tech. Elective	4	4		Tech. Elective	4	4		Tech. Elective	4	4
	Tech. Elective	4	4		Tech. Elective	4	4		Tech. Elective	4	4
	Seminar	1	1		Seminar	1	1		Grad. Elective	4	4
									Grad. Elective	4	4

Note: Technical elective requirements are the same as those for the regular Mechanical Engineering program.

Specimen Program in Computer Science

Second Year

Quarter 4			Quarter 5		
No.	Course	Q.H.	No.	Course	Q.H.
10.153	Calculus IV	4	10.210	Discrete Math	4
06.130	Assembly Lang. I	4	06.131	Assembly Lang. II	4
06.201	Data Structures	4	03.191	Comp Org & Des I	4
	Soc. Sci./Hum.	4		Soc. Sci./Hum.	4
06.111	Prog. Lang. Lab II	1	06.112	Prog. Lang. Lab. III	1

Third Year

Quarter 6			Quarter 7		
No.	Course	Q.H.	No.	Course	Q.H.
10.246	Lin. Algebra	4	05.145	Probability†	4
06.220	File Processing	4	06.230	Operating Sys.	4
03.192	Comp. Org. & Des.	4		Coordinated Study	4
	Coordin. Study	4		Soc. Sci./Hum.	4

Fourth Year

Quarter 8			Quarter 9		
No.	Course	Q.H.	No.	Course	Q.H.
05.147	Statistics I†	4	06.260	Compiler Des. I	4
06.240	Analysis of Prog. Lang.	4	06.265	Anal. of Algorithms	4
06.250	Automation and Formal Lang.	4		Coordinated Study	4
	Soc. Sci./Hum.	4		Soc. Sci./Hum.	4

Fifth Year

Quarter 10			Quarter 11		
No.	Course	Q.H.	No.	Course	Q.H.
	Comp. Sci. Elect.‡	4		Coordinated Study	4
	Coordin. Study	4		Coordinated Study	4
	Coordin. Study	4		Soc. Sci./Hum.	4
06.291	Comp. Sci. Proj.	4	06.295	Comp. Sci. Sem.	4

* Students interested in life science may be allowed to substitute 12.127-12.129 or 18.131-18.133 if schedule permits. 11.203, 11.204, 11.205 substituted for 11.117, 11.118, 11.119 for 1980-81 Academic Year.

† Students interested in the theoretical aspects of computer science should substitute 10.208 and 10.220.

‡ 06.280 Artificial Intelligence, 06.210 Computer Graphics, or 06.225 Data Base Management.

Lincoln College

Specimen Program in Electrical Engineering Technology

First Year

Quarter 1				Quarter 2				Quarter 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
10.407	Col. Alg. and Trig. I	4	4	10.408	Col. Alg. and Trig. II	4	4	10.420	Calculus I	4	4
11.417	Physics I	4	4	11.418	Physics II	4	4	11.419	Physics III	4	4
30.113	Fresh. Writ.	4	4	30.114	Intro. Lit.	4	4	30.206	Prof. Writing		4
09.421	Graphics I		4	06.400	Comp. Prog.		4	09.471	Graphics II		4
				11.473	Physics Lab I	2	2	11.474	Physics Lab II	2	2

Second Year

Quarter 4				Quarter 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
10.421	Calculus A	4	4	10.422	Calculus B	4	4
03.451	Circ. Analysis I	4	4	03.452	Circ. Analysis II	4	4
39.115	Economics		4	02.419	Mechanics		4
	Soc. Sci.		4		Soc. Sci.		4
				03.424	Cir. Lab I		2

Third Year

Quarter 6				Quarter 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
03.460	Eng. Analysis I	4	4	03.454	Circ. Analysis IV	4	4
03.453	Circ. Analysis III	4	4	03.412	Electronics II	4	4
03.411	Electronics I	4	4	03.410	Electrical Meas.	4	4
03.425	Circ. Lab II	2	2	03.423	Electronic Lab	4	4
03.430	Energy Conv.		4				

Fourth Year

Quarter 8				Quarter 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
03.413	Electronics III	4	4	03.428	Adv. Electronic Lab II	2	2
03.427	Adv. Electronic Lab I	2	2		Tech. Elective	4	4
	Tech. Elective		4	03.414	Pulse & Dig. I		4
	Soc. Sci.		4		Soc. Sci.		4
				05.437	Dist. Syst.		4

Fifth Year

Quarter 10				Quarter 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
03.429	Adv. Electronic Lab II	2	2		Tech. Elective	4	4
	Tech. Elective		4	03.478	Cont. Sys. II		4
03.477	Cont. Sys. I		4	03.471	Dig. Comp. II		4
03.470	Dig. Comp. I		4		Soc. Sci.		4

Technical Elective Sequences

(A) Power Systems Sequence

No.	Course	Q.H.
03.462	Bas. Pwr. Sys. I	4
03.463	Bas. Pwr. Sys. II	4
03.464	Bas. Pwr. Sys. III	4
	Tech. Elective	4

(B) Communications Engineering Sequence

No.	Course	Q.H.
03.417	Prin. of Com. Sys. I	4
03.418	Prin. of Com. Sys. II	4
03.419	Prin. of Com. Sys. III	4
	Tech. Elective	4

Specimen Program in Mechanical Engineering Technology

First Year

Quarter 1				Quarter 2				Quarter 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
10.407	Col. Alg. and Trig. I	4	4	10.408	Col. Alg. and Trig. II	4	4	10.420	Calculus I	4	4
11.417	Physics I	4	4	11.418	Physics II	4	4	11.419	Physics III	4	4
30.113	Fresh Writ.	4	4	11.473	Physics Lab I			11.474	Physics Lab II		
09.470	Engineering Graphics I or			30.114	Intro. Lit.	4	4	30.206	Lit. of Engineering	4	4
06.400	Prin. of Comp. Prog. 1	4	4	06.400	Prin. of Comp. Prog. 1 or			09.471	Engineering Graphics II	4	4
				09.470	Engineering Graphics I	4	4				

Second Year

Quarter 4				Quarter 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
10.421	Calculus A	4	4	10.422	Calculus B	4	4
09.484	Engr. Design Graphics	4	4	02.412	Mechanics B	4	4
02.411	Mechanics A	4	4	02.414	Stress Anal. A	4	4
03.420	Electricity & Electronics	4	4		A. & S. Elective	4	4

Third Year

Quarter 6				Quarter 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
02.415	Stress Anal. B	4	4	02.431	Materials A	4	4
02.473	Meas. & Anal. Lab	2	2	02.474	Technol. Lab A	2	2
02.421	Thermodynamics A	4	4	02.422	Thermodynamics B	4	4
02.413	Mechanics C	4	4	02.443	Fluid Mech. A	4	4
39.115	Econ. Prin. & Probs.	4	4				

Fourth Year

Quarter 8				Quarter 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
02.480	Mech. Design A	4	4	02.481	Mech. Design B	4	4
02.475	Tech. Lab B	2	2	02.476	Tech. Lab C	2	2
02.444	Fluid Mechanics B	4	4	02.423	Refrig. & Air Cond.	4	4
02.461	Machine Shop (Indus. Engr. Elec. on petition with experience)	4	4		A. & S. Elective I	4	4
	A. & S. Elec.	4	4				

Fifth Year

Quarter 10				Quarter 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
02.477	Tech. Lab. D	2	2	02.478	Tech. Lab E	2	2
05.460	Engr. Economy	4	4	02.430	Heat Transfer	4	4
	A. & S. Elec. I	4	4		Tech. Elec. I	4	4
	Tech. Elec. I	4	4		A. & S. Elec. I	4	4
02.432	Materials B or	4	4				
	or						
02.416	Stress Anal. C	4	4				

Technical electives must be chosen from the following list:

No.	Course	Q.H.	No.	Course	Q.H.
02.416	Stress Analysis C	4	10.423	Differential Equations	4
02.452	Exp. Stress Analysis	4	03.421	Electricity and Electronics	4
02.451	Mech. Vibrations	4	03.490	Optical instrumentation	4
02.432	Materials B	4	04.481	Nuclear Technology	4
02.433	App. Metallurgy	4			
02.479	Power Gen.	4			

College of Nursing

Specimen Program for Baccalaureate Degree in Nursing

First Year

Quarter 1					Quarter 2					Quarter 3				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
18.141	Bas. Anl. Bio.I	3	4	4	12.106	Gen. Chem.	4	3	5	12.104	Gen. Chem.	4	3	5
23.101	Western Civ.	3		4	18.142	Bas.Anl.Bio.II	3	4	4	18.148	Hum. Anat.	3	3	4
30.113	Fresh Writ.	4		4	30.114	Intro. to Lit.	4		4	23.102	Western Civ.II	4		4
80.217	Nursing	4		4	80.218	Nursing	4		4	80.219	Nursing	4		4

Second Year

Quarter 4					Quarter 5				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
18.120	Bas. Microbio.	3	4	4	18.144	Hum. Physiol.I	3	3	4
18.143	Hum. Physiol.	3	3	4	19.106	Fnd. Psych. I	4		4
19.105	Fnd. Psych.	4		4	20.100	Soc. Anthro.	4		4
80.220	Nursing	4	6	6	80.221	Nursing	4	6	6

Third Year

Quarter 6					Quarter 7				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
Section I					Section I				
19.141	G and D I	4		4	19.142	G and D II	4		4
19.130	Soc. Psych.	4		4	21.100	Sociology	4		4
83.202	Psych. Nursing	4	9	7	73.116	Pharmac.	3		3
					80.207	Nursing	5	6	7
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
Section II					Section II				
19.141	G and D I	4		4	19.142	G and D II	4		4
73.116	Pharmacol.			3	19.130	Soc. Psych.	4		4
21.100	Sociology	4		4	83.202	Psych. Nurs.	4	9	7
80.207	Nursing	5	6	7					

Fourth Year

Quarter 8					Quarter 9				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
82.201	Mat. Child.Nur.*	4	15	9	81.201	Med. Surg.			
	Hum. Elective	4		4		Nursing*	4	15	9
	Gen. Elective	4		4		Hum. Elective	4		4
						Gen. Elective	4		4

Fifth Year

Quarter 10					Quarter 11				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
84.201	Com. Hlth.Nur.	5	12	9	85.201	Contemp. Nur.	2	21	9
	Elective	4		4		Elective	(4)		(4)
	Elective	4		4		(if desired)			

* Each of these courses is offered in Quarters 8 and 9, but only one is to be taken per quarter.

179 Q.H. = Minimum graduation requirement.

Degrees

The College of Nursing offers a five-year program leading to the Bachelor of Science degree in Nursing, and Registered Nurse day and evening programs leading to the Bachelor of Science degree in Nursing. The length of these programs varies, depending on the individual's interest and ability to achieve advanced placement.

Quantitative Requirements

Candidates for the Bachelor of Science degree must successfully complete all of the prescribed courses in the applicable curriculum. For the Bachelor of Science degree this totals 179 quarter hours. The prescribed periods of cooperative work at health agencies associated with the University are not required of the Bachelor of Science Programs for Registered Nurses.

College of Pharmacy and Allied Health Professions

Specimen Program in Pharmacy (Five-Year Cooperative)

First Year

Quarter 1					Quarter 2					Quarter 3				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
	Electives			8	18.131	Gen. Bio.	3	4	4	71.259	Bas. Pharmacy	3		3
10.104	Fund. Math.*	4		4	10.105	Funct. and Bas. Cal.*	4		4	12.119	Gen. Chem.†	4	3	5
10.105	Funct. and Bas. Cal.*	4		4	10.107	Calculus*	4		4	18.132	Anl. Bio.	3	4	4
12.106	Gen. Chem.	4	3	5	30.113	Fresh. Writ.			4	30.114	Intro. Lit.	4		4
					87.135	Prof. Dynamics in Health Care Deliv. Sys.	4		4					

*Minimum math requirement: 10.107.

†12.127, 12.128, General Chemistry, may be taken in place of 12.119, but one year of high school calculus is recommended.

Second Year

Quarter 4 (Entire Class) (Sept.-Dec.)					Quarter 4A (Entire Class) (Jan.-March)					Quarter 5 (April-June & June-Sept.)				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
11.171	Physics I	4		4	11.175	Physics III	4		4	73.202	Anat. & Physiology	4	(3)	5
12.144	Organic Chem.	4	(3)	5	12.145	Organic Chem. A. & S.	4	(3)	5	93.156	Bio. Chem. A. & S. Electives	5		5
21.107	Soc. Psych.‡	4		4		Electives	8		8			8		8

‡21.107 may be taken during any quarter of the second year.

Third Year

Quarter 6					Quarter 7				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
71.140	Pharmaceutics	4		4	71.141	Pharmaceutics	5		5
72.135	Anti-infectives Struc. & Action	5		5	73.245	Pathology	4		4
73.204	Anat. & Phys. II	4	(3)	5	73.229	Pharmacol. Lab. I	0	(3)	1
72.263	Med.Chem./Pharmacol. I	4		4	71.142	Pharmaceu. L.	1	(3)	2
					73.264	Pharmacol. Med./Chem. II	6		6

Fourth Year

Quarter 8					Quarter 9 (Entire Class) (April-June)				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
73.265	Pharmacol. Med./Chem. III	6		6	73.247	Toxicology	4		4
71.264	Bioph./P'kin.	4		4	71.288	Non-Prescrip. Medication	4		4
73.230	Pharmacol. Lab. II	0	(3)	1	71.268	Clin. Pharmacol. therapeutics	5		5
73.230	Drug Analysis	4	(3)	5	71.269	Pharmacokinetic Prin. in Drug Therapy	4		4

Fifth Year

Quarter 10			Quarter 10A			Quarter 11		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
71.255	Clin. Clerkship	15	71.255	Clin. Clerkship	15	71.255	Clin. Clerkship	15
71.200	Pharm. Externship	4	71.200	Pharm. Externship	4	71.200	Pharm. Externship	4
71.243	Pharm. Jurisprudence	4	71.227	Parapharmaceuticals	2	71.243	Pharm. Jurisprudence	4
71.296	Community Pharm. Mgmt. or	4	71.284	Prof. Practice Lab	1	71.296	Community Pharm. Mgmt. or	4
71.244	Hospital Pharm. Mgmt.	4	71.245	Pharm. Administration	4	71.244	Hospital Pharm. Mgmt.	4
71.218	Caring for Patients: Psychosocial Aspects of Illness	4	71.220	Interpersonal Skills for Health Professionals	4	71.218	Caring for Patients: Psychosocial Aspects of Illness	4
	Professional Elective	4		Drug Info. and Eval.	3		Professional Elective	4
	Professional Elective	4		Professional Elective	4		Professional Elective	4

Note: About one-quarter of the class will be in 71.255, one-quarter in 71.200, and one-half in the classroom for each quarter.

Specimen Program in Dental Hygiene***First Year**

Quarter 1					Quarter 2					Quarter 3				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
12.111	Gen. Chem.	3	(3)	4	12.112	Gen. Chem.	3	(3)	4	18.120	Bas. Microbio.	3	4	4
18.114	Human Anat. & Physiology I Prof. Courses	4	(3)	5	18.115	Human Anat. & Physiology II Prof. Courses	4	(3)	5		Prof. Courses		(4)	

Second Year

Quarter 4				Quarter 4A				Quarter 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
30.113	Fresh. Writ. Prof. Courses	4	4	19.105	Fnd. Psych. I Prof. Courses	4	4	21.100	Intro. Soc.	4	4
								30.114	Intro. Lit. Prof. Courses	4	4

*Students are admitted directly to the Forsyth School for Dental Hygienists and should contact the School for catalogs, applications, and complete program information by writing to:

Forsyth School for Dental Hygienists
140 The Fenway
Boston, Massachusetts 02115

**Specimen Program in Medical Laboratory Science
(Five-Year Cooperative)****First Year**

Quarter 1					Quarter 2					Quarter 3				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
10.104	Fund. Math. or	4		4	10.105	Func. and Bas. Calc. or					Elective	4		4
10.105	Func. and Bas. Calc.	4		4	10.107	Calculus	4		4	30.114	Elective	4		4
12.127	Gen. Chem. or	4	(3)	5	12.119	Gen. Chem.	4	3	5	87.150	Intro. Lit.	4		4
12.106	Gen. Chem.	4	(3)	5	18.132	Ani. Bio.	3	(4)	4		Bas. Med. Lab. Sci.	2	(3)	3
18.131	Gen. Bio.	3	(3)	4	87.100	Lab. Med. Orient	1		1	12.171	Analyt. Chem.*	3	(3)	4
30.113	Fresh. Writ.	4		4	87.135	Prof. Dynamics in the Hlth. Care Deliv. System.	4		4					

Second Year**Quarter 4 Entire Class*****Quarter 4A Entire Class*****Quarter 5†**

No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
12.144	Organ. Chem. I	4	(3)	5	87.152	Bas. MLS				12.145	Organic			
	Elective	4		4		Hemat. II	2	(3)	3		Chem. II	4	(3)	5
18.143	Hum.				87.153	Bas. MLS				18.144	Hum.			
	Physiology I	3	(3)	4		Immunohem.	2	(3)	3		Physiology	3	(3)	4
87.154	Bas. MLS Clin.				87.151	Bas. MLS Hemat	2	(3)	3	87.155	Bas. MLS			
	Microbio.	4	(6)	6	87.113	Clinical					Clin. Chem.	4	(3)	5
						Immunology	2	(3)	3		Elective	4		4
						Elective			4					

*Depending on group assignment, this is a sample of the second year.

†Regular co-op sequence starts here; MLT applies for clinical.

Third Year**Quarter 6*****Quarter 7**

No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
18.135	Genetic & Devel. Bio.	3	(4)	4	18.136	Cell Physiology and Biochem.	3	(4)	4
11.171	Physics I†	4		4	11.172	Physics II‡	4		4
87.106	Bas. MLS. Electronics & Instru. I		(3)	1	18.221	Gen. Microbio. Elective	3		3
87.204	Med. Parasit	1	(3)	2			4		4
87.114	Mycology,	1	(3)	2					
87.250	Communic. Hlth. Sci. Elective	4		4					
		4		4					

*M.T. apply for Clinical

Fourth Year**Quarter 8****Quarter 9**

No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
87.162	Hemat. App. Study	3		3	87.162	Hemat. Appl. Study	3		3
87.163	Immunohem. App. Study	2		2	87.163	Immunohem. App. Study	2		2
87.164	Clin. Microbio. App. Study	5		5	87.164	Clin. Microbio. App. Study	5		5
87.165	Clin. Chem. App. Study	5		5	87.165	Clin. Chem. App. Study	5		5
87.232	Hemat. III	3		3	87.280	MLS Spec. Topic	2		2
87.225	Clin. Chem. II	2		2	87.242	Hemat. IV	2		2
87.224	Clin. Micro. II	2		2	87.244	Clin. Micro. IV	2		2
					87.245	Clin. Chem. IV	2		2

Fifth Year**Quarter 10**

No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
87.162	Hemat. App. Study	3		3		Prof. Elective	4		4
87.163	Immunohem. App. Study	2		2		Elective	4		4
87.164	Clin. Microbio. App.	5		5	87.221	Med. Lab. Mgt.	2		2
87.165	Clin. Chem. App. Study	5		5	87.226	MLS. Education	2		2
87.253	Immunohem.	2		2	87.281	MLS. Sen. Sem.	2		2
87.235	Clin. Chem. IV	2		2					
87.234	Micro. III	2		2					

*12.172 may be substituted for 12.171.

†11.117 may be substituted for 11.171.

‡11.118 may be substituted for 11.172.

Note: The minimum elective requirements are: 12 Q.H. humanities, 12 Q.H. social sciences, and 12 Q.H. other.

Specimen Program in Health Record Administration (Five-Year Cooperative)

First Year

Quarter 1					Quarter 2					Quarter 3				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
10.101	Bas. Math	4		4	10.102	Bas. Math	4		4	*	Mod. Lang. or	4		4
18.131	Gen. Bio.	3	(3)	4	30.114	Intro. Lit.	4		4	*22.111	Amer. Govt.	4		4
19.105	Fnd. Psych. I	4		4	18.132	Ani. Bio.	3	(4)	4	19.106	Fnd. Psych. II	4		4
30.113	Fresh. Writ.	4		4	*	Mod. Lang. or	4		4		A & S			
86.158	Orient. Med. Rec. I	1		1	*22.110	Pol. Sci.	4		4		Elective			4
					86.159	Orient. Med. Rec. II	1		1	18.121	Microbio.	3		3

Second Year

Quarter 4					Quarter 5				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
18.114	Func. Hum. Anat. I	4	(3)	5	18.146	Hum. Anat. & Physiol. II	3	(3)	4
*23.101	West. Civ. I or	4		4	*23.102	West. Civ. II or	4		4
*39.115	Prin. and Prob. Econ.	4		4	*39.116	Prin. & Prob. Econ. or	4		4
45.209	Org. Behav. I	4		4	*39.130	Med. Econ.	4		4
21.100	Intro. Soc. 4	4		4	10.108	Prob. Stat. & Computers	4		4
87.134	Dynamics of Health	2		2	29.129	Intro. to Com. Skills	4		4

Third Year

Quarter 6					Quarter 7				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
86.102	Hosp. Law.	2		2	86.162	Mgt. Prin.			
86.151	Hlth. Rec. Sci. I	3	(3)	4	86.113	Hlth. Care Fnd. Med. Sci. II	4		4
86.107	Med. Term.	4		4	86.152	Hlth. Rec. Sci. III	3	(3)	4
86.112	Fnd. Med. Sci. I	3		3	86.160	Intro. to Data Proc. Hlth. Sci.	4		4
	Elective	4		4					

Fourth Year

Quarter 8					Quarter 9				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
86.153	Hlth. Rec. Sci. III	3	(3)	4	18.164	Spec. Topic I*			2
05.127	Conc. & Appl. Work Des.	4		4	86.165	Spec. Topic II*			2
86.164	Spec. Topic I*			2	86.166	Appl. Hlth. Stat.	4		4
86.165	Spec. Topic II*			2	86.154	Hlth. Rec. Sci. IV	3	(3)	4
86.173	Clin. Sem.	2		2	86.266	Org. & Mgt. Med. Rec. II	3	(3)	4
86.260	App. Hlth. Rec. Prac. I			3	86.261	App. Hlth. Rec. Prac. II			1
86.265	Org. & Mgt. Med. Rec. Dp. I	3	(3)	4	86.161	Quality Assur.	4		4

Fifth Year

Quarter 10					Quarter 11				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
86.164	Spec. Topic I*			2	86.157	Sem. Hlth. Rec	2		2
86.165	Spec. Topic II*			2	86.164	Spec. Topic I*			2
86.267	Org. & Mgt. Med. Rec. III	3	(3)	4	86.165	Spec. Topic II*			2
	Elective			4	86.167	Hlth. Rec. Prof. Issues & Prob.	2		2
86.168	Med. Comp. App.			4	86.264	App. Hlth. Rec. Prac. III			4
87.226	Hlth. Sci. Ed.			2					

*Requires permission of Program Director.

Specimen Program in Respiratory Therapy B.S. (Five-Year Cooperative)

First Year

Quarter 1					Quarter 2					Quarter 3				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
10.104	Fund. Math.	4		4	10.105	Func. and Bas. Calc.	4		4	30.114	Intro. Lit.	4		4
12.106	Gen. Chem.	4	(3)	5						12.119	Gen. Chem.	4	(3)	5
18.141	Bas. Ani. Bio.	3	(3)	4	18.142	Bas. Ani. Bio. II	3	(4)	4	18.120	Microbio.	3	(4)	4
30.113	Fresh. Writ.	4		4	11.136	Bas. Physics	3		4	86.213	Resp. Ther. Sem. III	1		1
86.211	Resp. Ther. Sem. I	1		1	86.103	Bas. Med. Term.	2		2		A & S Elective			4
					86.212	Resp. Ther. Sem. II	1		1					
					87.135	Prof. Dynamics in the Hlth Care Delivery Sys.	4		4					

Second Year

Quarter 4					Quarter 4A					Quarter 5				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
73.202	Anat. Physiol.	4	(3)	5	73.117	Pharmacol./ Resp. Care	4		4	86.203	Prof. Prac. Lab. III		(3)	1
86.201	Prof. Prac. Lab I		(3)	1	73.204	Anat. Physio.	4	(3)	5	86.214	Clin. Sem. I	1		1
86.221	Intro. Patient Care	2		2	86.202	Prof. Prac. Lab. II		(3)	1	86.233	Resp. Care/ Med. Surg.	4		4
86.226	Cardio. Pul. Phys.	4		4	86.222	Intro. Resp. Care	3		3	86.102	Hosp. Law	2		2
	A. & S. Elective			4	86.227	Cardio.-Pul. Dis.	4		4	86.228	Clin. Prac. I		(24)	6

Third Year

Quarter 6					Quarter 7**				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
86.112	Fnd. Med. Sci. I	3		3	86.205	Cardio.-Pul. Lab. Prac.		(3)	1
86.204	Prof. Prac. Lab. IV		(3)	1	86.225	Cardio.-Pul. Tech.	3		3
86.229	Clin. Prac. II		(24)	6	86.281	Pediatrics	2		2
86.215	Clin. Sem. II	1		1		A. & S. Electives			8
86.234	Resp. Care/ Crit. Patient	4		4					

Fourth Year

Quarter 8					Quarter 9				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
12.144	Organic Chem. I	4	(3)	5	12.145	Organic Chem. II	4	(3)	5
86.216	Adv. Resp. Thry. Sem. I	1		1	86.217	Adv. Clin. Sem. II	1		1
86.271	Adv. Life Sup. Sys. I	4		4	86.272	Adv. Life Sys. II	4		4
86.278	Adv. Med. Monit.	4		4	86.274	Adv. Clin. Phys. Prof. Elective	4		4

Fifth Year

Quarter 10					Quarter 11				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
86.218	Adv. Clin. Sem. III	1		1	86.219	Adv. Clin. Sem. IV.	1		1
86.276	Neonatology	4		4	86.288	Practicum		(16)	4
86.277	Dir. Study			2		A & S. Electives			8
86.287	Practicum		(16)	4		Prof. Elective			4

Specimen Program in Toxicology (Five-Year Cooperative)

First Year

Quarter 1					Quarter 2					Quarter 3				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
10.104	Math	4		4	10.105	Math	4		4	10.107	Calculus	4		4
	Elective	4		4	12.106	Gen. Chem.	4	(3)	5	30.114	Intro. Lit.	4		4
18.131	Gen. Bio. I	2	(4)	4	18.132	Gen. Bio. II	3	(4)	4		Elective	4		4
30.113	Fresh. Writ.	4		4	73.130	Tox. Orien.	1		1	12.119	Gen. Chem.	4	(3)	5
					87.135	Prof. Dynamics in Hlth. Care Delivery System								
							4		4					

Second Year

Quarter 4					Quarter 4A (entire class)					Quarter 5				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
11.171	Physics	4		4	11.175	Physics	4		4	93.156	Gen. Biochem.	5		5
12.144	Org. Chem.	4	(3)	5	12.145	Org. Chem.	4	(3)	5	10.108	Prob. Stat.	4		4
73.202	Anat. & Phys.	4	(3)	5	73.204	Anat. & Phys.	5	(3)	5	01.197	Sur. Env. Prob. or Elective	4		4
	Elective	4		4							Elective	4		4

Third Year

Quarter 6					Quarter 7				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
18.120	Micro	3	(4)	4	73.264	Pharmacol			
72.263	Med. Chem.					Med.Chem. II	6		6
	Pharmacol I	4		4	12.253	Id. of Org. Comp.	1	(6)	3
72.261	Id. Abuse Drugs	2	(6)	4	73.247	Toxicology I	4		4
01.197	Survey Env. Prob. or Elective	4		4	73.229	Pharmacol. Lab		(3)	1

Fourth Year

Quarter 8					Quarter 9				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
73.265	Pharmacol Med. Chem. III	6		6	73.261	Special Topics	4		4
73.230	Pharmacol. Lab. II	0	(3)	1	87.155	Basic MLS Clin. Chem. & Instru.	4	(3)	5
73.253	Tox. II-Fund. Prin. of Tox.	4		4	73.247	Tox. I or Elective	4		4
73.256	Tox. Lab.	0	(3)	1	73.245	Pathology	4		4
72.230	Drug Analysis	4	(3)	5					

Fifth Year

Quarter 10					Quarter 11				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
73.254	Tox. III	4		4	65.219	Comm. Health	4		4
73.215	Drug Interactions	4		4		Elective	4-8		4-8
71.264	Bio. Pharm./ Pharm.	4		4		Tox Colloq.	3		3
12.179	Inst. Analysis	3	(6)	5	25.180	Epidemiology	4		4

University College

Alternative Freshman-Year Program

Business Track: One-Year Program

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
10.100	Math. I*	4	10.110	Math. II*	4	10.118	Col. Math.	
30.400	Fund. of Eng. I*	4	23.309	Hist. of Civ. A	4		Business	4
51.531	Integ. Lang. Skills		30.402	Fund of Eng. II*	4	23.310	Hist. of Civ. B	4
	Devel. I*	2	51.532	Integ. Lang. Skills		39.601	Economics I	4
				Devel. II*	2	49.499	Mgt. and Org. (Int.)	4

Criminal Justice, Education, or Arts and Sciences Track: One-Year Program

Quarter 1			Quarter 2			Quarter 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
23.309	Hist. of Civ. A	4	21.401	Prin. Soc. I	4	21.402	Prin. Soc. II	4
30.400	Fund. of Eng. I*	4	22.401	Intro. Pol. Sci. I	4	22.402	Intro. Pol. Sci. II	4
51.531	Integ. Lang.		30.402	Fund. of Eng. II*	4	23.310	Hist. of Civ. B	4
	Skills Devel. I*	2	51.532	Integ. Lang. Skills			Elective	4
				Devel. II*	2			

*Compensatory course

Course Numbering System

The number to the left of the decimal point indicates the academic department offering the course. The three digits after the decimal point differentiate the course within the department.

Accounting	41.	History	23.
African-American Studies	25.	Industrial Engineering	05.
Allied Health Professions	86.-87.	Interdisciplinary Courses	93.
Medical Laboratory Science		International Business	
Health Record Administration		Administration	46.
Respiratory Therapy		Journalism	38.
Anthropology	20.	Management	45.
Art	27.	Marketing	43.
Biology	18.	Mathematics	10.
Business, General	49.	Mechanical Engineering	02.
Chemical Engineering	04.	Military Science	91.
Chemistry	12.	Modern Languages	
Civil Engineering	01.	French	31.
Computer Science	06.	German	33.
Cooperative Education	90.	Italian	35.
Criminal Justice	92.	Portuguese	36.
Drama	29.	Russian	34.
Earth Sciences	16.	Spanish	32.
Economics	39.	American Sign Language	36.
Education-Counseling	53.	Music	28.
Education-Foundations	50.	Nursing	80.-85.
Education-Curriculum		Pharmacy and Toxicology	71.-73.
and Instruction	51.	Philosophy and Religion	26.
Education-Speech and		Physical Education	62.
Hearing	55.	Physical Therapy	64.
Special Education		Physics	11.
and Rehabilitation	56.	Political Science	22.
Electrical Engineering		Psychology	19.
and Computer Engineering	03.	Recreation and	
English	30.	Leisure Studies	63.
Finance and Insurance	44.	Sociology	21.
Graphic Science	09.	Speech Communication	37.
Health Education,		Transportation	48.
School and Community	65.		

Classes at Northeastern University are scheduled in different modules.

In assessing quarter weights for courses, the following statement applies: *One quarter-hour of credit is equal to 50 minutes of instruction per week, plus two hours of preparation.*

The Scheduling Office (116 HA) maintains all quarter hour weights for courses. In the event of error in any publication, the academic record will reflect the correct quarter hours applicable to any degree requirement.

SPECIAL NOTE

Some course titles may change but the course number remains the same. Be sure you do not register for a course you may have already taken.

Basic College Compensatory Programs for 1982-1983

The Basic College Compensatory Education Program continues generally to encompass five courses, each bearing four quarter hours of credit, which are to be offered in the sequences indicated below. Certain freshmen may be assigned to any one of these course sequences based on tests administered during orientation week.

Fall		Winter	
10.100	Mathematical Preliminaries I	10.110	Mathematical Preliminaries II
30.101	Fundamentals of Writing I	30.102	Fundamentals of Writing II
51.146	Reading/Study Skills		

Specifically, 10.100 and 10.110 are to precede both the 10.104, 10.105, and 10.107 (non-business math) sequence and the 10.118, 10.119, and 49.249 (business math) sequence; 30.101 and 30.102 collectively replace 30.113 (standard Freshman Writing) and are to precede 30.114 (standard Introduction to Literature) and, in the case of Lincoln College, the 30.114-30.206 (Literature of Engineering) sequence.

Schedule for Continuation of Compensatory Programming in the Basic Colleges for 1982-1983

These courses are approved or disapproved for credit, except where noted, by the faculties of the individual colleges and are, therefore, subject to change.

	30.101* Writing I	30.102 Writing II	10.100* Math Prelim. I	10.110* Math Prelim. II	51.146 Read. Study Skills
Arts and Sciences	accepted	accepted	accepted	accepted	accepted
B-B Phys. Ther.	not accepted	not accepted	not accepted	not accepted	not accepted
Phys. Educ.	accepted	accepted	accepted	accepted	accepted
Rec. and Leis. Stud.	accepted	accepted	not accepted	not accepted	not accepted
Health Educ.	accepted	accepted	accepted	accepted	accepted
Bus. Admin.	accepted	accepted	accepted	accepted	not accepted
Crim. Justice	accepted	accepted	accepted†	accepted†	accepted
Education	accepted	accepted	accepted	accepted	accepted
Engineering‡	not applicable	not applicable	not applicable	not applicable	not applicable
Lincoln College	accepted	accepted	not applicable	not applicable	not accepted
Nursing B.S.	accepted	accepted	not accepted	not accepted	not accepted
Pharmacy and Allied Health Prof.	accepted§ w/o credit	accepted	not accepted	not accepted	not accepted

* Graded pass/fail and therefore not included in the student's quality-point average.

† Freshmen in the College of Criminal Justice are not required to take a mathematics course in the freshman year. They can elect, however, to take 10.100 or 10.110 to prepare themselves for Fundamentals of Mathematics 10.104 as upperclassmen.

‡ Although the College of Engineering does not allow 10.100 or 10.110 to be taken for academic credit, it does offer a special course sequence in college calculus with algebra and trigonometry (10.144 and 10.145) for engineering freshmen judged to have deficiencies in mathematics. The courses involve extra hours of work but cover the same material as the regular freshman calculus sequence in the College of Engineering.

§ Although the College of Pharmacy and Allied Health Professions does allow 30.101 to appear on the permanent record, it will only allow 30.102 for credit. Students completing the 30.101-30.102 sequence will have to make up the four-credit elective which was displaced by 30.101.

Civil Engineering

The course descriptions listed under Civil Engineering are intended to show the general scope of the subject that will be covered. Since courses are continuously updated, specific topics or method of approach may vary from term to term.

01.101 Special Topics 4 Q.H.

(Prereq. Outstanding academic performance)

The course offers individual study in an area within the field of civil engineering, selected by the student and his/her instructor with approval by the appropriate discipline committee, resulting in a definitive report and an oral presentation.

01.102 Special Topics In Civil Engineering 4 Q.H.

(Prereq. Permission of instructor)

This is a special course within the field of civil engineering initiated by the appropriate discipline committee and approved by the department.

01.105 Civil Engineering Systems 4 Q.H.

(Prereq. 10.153)

The course covers application of system synthesis and optimization techniques for civil engineering students; Calculus method, linear programming, network analysis, and dynamic programming.

01.116 Engineering Measurements 4 Q.H.

(Prereq. 10.151 and 11.204)

The course focuses on the methods and instruments used in obtaining engineering measurements required in land surveying and their applications in topographic mapping, leveling, traverses, horizontal and vertical curves, and earthwork.

01.117 Engineering Measurements

Laboratory

2 Q.H.*

(Prereq. 09.108)

Taken simultaneously with 01.116. The course concentrates on field problems, illustrating the lecture material in 01.116 with computer applications.

01.120 Fluid Mechanics 4 Q.H.

(Prereq. 10.115, 02.116)

An introduction to fluid mechanics, both statics and kinematics, topics normally include properties of fluids; pressure distribution on submerged bodies; momentum, continuity, and energy formulations; resistance to flow in closed conduits; continuous and local losses; dimensional analysis and dynamic similitude.

01.122 Hydraulic Engineering 4 Q.H.

(Prereq. 01.120)

Topics normally include open channel flow, including flow formulas, specific energy, hydraulic jump, water surface profiles in varied flow, channel controls, sewer system design considerations; hydrology, including storm drainage

design, unit hydrograph, reservoir sizing; pipe network analysis and pump characteristics.

01.135 Construction Engineering 4 Q.H.

(Prereq. Seniors only)

An overall perspective of the construction industry and tasks that must be addressed by construction management, including resource allocation, construction environment, organization, contracts, funding, cash flow, productivity, labor relations, network planning and scheduling, and project control and safety.

01.136 Highway Engineering 4 Q.H.

(Prereq. 01.116 and 01.178)

A general approach to highway engineering, topics normally include administration, economic factors, planning, environmental impacts, geometric design, drainage, and the design of flexible pavements.

01.140 Structural Mechanics I 4 Q.H.

(Prereq. 11.204; 10.153 concurrently)

Topics normally include statics of particles and rigid bodies in two and three dimensions; analysis of internal forces in trusses and beams; centroids and centers of gravity of lines, area, and volumes; moments of inertia of areas and masses.

01.141 Structural Mechanics II 4 Q.H.

(Prereq. 01.140)

Course material includes analysis of stress and strain; mechanical properties of materials; elastic analysis of stresses and deformations of members subject to axial load, torsion, shear, and moment; introduction to column behavior.

01.142 Structural Mechanics III 4 Q.H.

(Prereq. 01.141)

Continuation of 01.141. Topics include torsion, general bending, curved members, shear flow, shear center, combined stresses including elastic and plastic behavior, continuation of column buckling, and introduction to yield and fracture criteria.

01.143 Structural Analysis I 4 Q.H.

(Prereq. 01.141)

Topics normally include review of reactions, shear and bending moment diagrams, bar forces in trusses; deflections by virtual work and moment area methods; and analysis of indeterminate structures by consistent deformations, slope deflection, and moment distribution.

*Lab fee required.

01.144 Structural Analysis II**4 Q.H.**

(Prereq. 01.143)

This course concentrates on matrix analysis of indeterminate structures using both flexibility and stiffness approaches; computer applications to analysis of framed structures.

01.145 Structural Analysis III**4 Q.H.**

(Prereq. 01.143)

This course is a continuation of 01.143. Topics normally include slope deflection; moment distribution; effects of axial loads; symmetry; antisymmetry; nonprismatic members; influence lines for determinate and indeterminate structures, approximate methods of lateral load analysis and shear wall action.

01.150 Concrete Design I**4 Q.H.**

(Prereq. 01.143)

Course material includes review of mechanical properties of steel and concrete; behavior and design of reinforced concrete beams for shear, moment, and bond; design of stocky columns for axial load and moment. Emphasis of course is on strength design.

01.152 Concrete Design II**4 Q.H.**

(Prereq. 01.150)

Topics normally include design of slender columns, foundations, multistory buildings with one-way and two-way floor systems.

01.160 Structural Design I**4 Q.H.**

(Prereq. 01.143)

The course focuses on design of steel members subject to tension, compression, bending, and combinations of loading; design of connections, braced frames, and rigid frames.

01.161 Structural Design II**4 Q.H.**

(Prereq. 01.160)

Topics normally include design of steel plate girders, composite construction in bridges and buildings, plastic analysis and design, and the design of high-rise buildings subject to lateral loads.

01.174 Foundation Engineering**4 Q.H.**

(Prereq. 01.178)

Topics normally include subsurface explorations, determination of soil-bearing capacity, design of shallow foundations, pile and caisson foundations, design of retaining walls, anchored bulkheads and braced sheeting, and other selected topics on foundation design and construction.

01.175 Geotechnology**4 Q.H.**

(Prereq. 01.141 and 01.180)

An introduction to the geological sciences as they apply to civil engineering practice, the course focuses on the effects of significant geological features on location, design, construction, operation, and maintenance of engineering projects.

01.178 Soil Mechanics**4 Q.H.**

(Prereq. 01.141 and 01.120)

Course material includes soil classification, soil-water phase relations, ground water seepage, consolidation theory, strength properties of soils, stress distributions in soils due to surface loads, slope stability.

01.179 Soil Mechanics Lab**2 Q.H.***

(Taken concurrently with 01.178)

The course focuses on laboratory exercises, including soil classification, seepage, shear strength, consolidation, and triaxial testing.

01.180 Materials**4 Q.H.**

(Prereq. 12.115)

The course focuses on the structural, chemical, and mechanical properties of materials of importance to civil engineers; fundamental nature of matter; significance of phase transformations; control of microstructure; mechanisms of failure of materials.

01.193 Environmental Engineering I**4 Q.H.**

(Prereq. 12.115 and 01.120)

The course focuses on engineering approaches to protection and management of the environment. Topics include assessment of environmental quality; introduction to water and wastewater technology, air pollution control, and solid waste management.

01.194 Environmental Engineering II**4 Q.H.**

(Prereq. 01.193)

The course concentrates on development of fundamental physical, chemical, and biological phenomena of water and wastewater systems with engineering applications in water technology from source to ultimate disposal.

01.195 Environmental Engineering III**4 Q.H.**

(Prereq. 01.122 and 01.194)

The course concentrates on engineering applications and special topics in water and wastewater technology, including pumping, chemical feeding, treatment plant design, and land disposal.

01.196 Environmental Design**4 Q.H.**

(Prereq. 01.122 and 01.194; 01.195 to be taken concurrently)

The course provides a combination of individual design projects and environmental laboratory sessions affording the student the opportunity to develop a sound engineering approach to the solution of problems in water and wastewater management. One design session and one laboratory session per week.

01.197 Survey of Environmental Problems**4 Q.H.**

(Prereq. Nonengineers only; permission of instructor)

A survey of problems associated with man's use of the environment, course material includes interrelation of the air-water-land complex, with

*Lab fee required.

emphasis on ecological stresses produced, and methodologies for assessing and controlling man's environmental impact.

01.206 Applied Probability Theory for Civil Engineers 4 Q.H.

(Prereq. 10.153)

Topics normally include applications of probability theory to civil engineering problems, probabilities of events, random variables and distributions, derived distributions, expectation, common probability models, and an introduction to statistics.

01.207 Technology Assessment 4 Q.H.

(Prereq. Permission of instructor)

The course focuses on fundamental concepts of technology assessment, such as the market system, externalities, decision analysis, risk acceptance, the problems of scale, and technological monocultures. The unintended impacts or the higher-order effects of technologies are stressed throughout the course.

01.210 Legal Aspects of Civil Engineering 4 Q.H.

Topics normally include description and evaluation of various types of contracts for engineering services and construction, procedures and

formats for submitting bids, procedures for filing claims, and legal steps to avoid liabilities.

01.234 Transportation Analysis and Planning 4 Q.H.

(Prereq. Juniors and seniors only)

Course material includes establishment of planning framework; demand modeling from regional economy to transportation network assignments; mode selection; technical and economic evaluation; and current issues including environmental assessment, transportation systems management, citizen participation, and planning in developing countries.

01.259 Air Pollution 4 Q.H.

The course focuses on theory and practice related to engineering management of air resources; microclimate and dispersion of pollutants; atmospheric chemistry; air pollution instrumentation; control of gaseous and particulate emissions; design of air pollution control systems; biological and chemical aspects of air pollution with emphasis on the toxicological aspects of the environment; physiological effects of aerosols; analysis of organic and inorganic constituents of the atmosphere; and rationale for establishment of air quality criteria and standards.

Mechanical Engineering

The course descriptions listed under Mechanical Engineering are intended to show the general scope of the subject that will be covered. Since courses are continuously updated, specific topics or methods of approach may vary from term to term.

02.116 Dynamics 4 Q.H.

(Open to civil engineering majors)

(Prereq. 01.140)

Topics include kinematics, translating reference frames, mass moments of inertia, plane motion of rigid bodies, and instantaneous equations of motion.

02.130 Thermodynamics I 4 Q.H.

(Prereq. 10.153)

Thermodynamics is the study of systems in which energy and its flow across systems boundaries are important. In this first course energy, heat, and work are defined and used in the First Law of Thermodynamics. Other thermodynamic properties and equations of state are introduced, with emphasis on tabular and graphical forms for simple compressible systems and on the ideal gas. Phases and phase transitions are briefly discussed, and energy analysis of both open and closed systems is examined. The Second Law of Thermodynamics and the property entropy are introduced, and their macro- and microscopic implications discussed. Emphasis,

however, is placed on the macroscopic consequences of irreversibility and the limitation this places, through the Second Law, on the behavior of engineering systems. This course concentrates on basic concepts and their proper application to representative engineering systems.

02.131 Thermodynamics II 4 Q.H.

(Prereq. 02.130)

Course includes study of vapor cycles for use with both fossil and nuclear fuels; consideration of various gas power cycles, including the Brayton and regenerative gas turbine cycles, and the Otto and Diesel cycles for reciprocating internal combustion engines. The concept of availability is introduced, integrated with the study of the above cycles, and followed by the thermodynamics of nonreacting mixtures, particularly for air-water vapor mixtures.

02.132 Introduction to Combustion 4 Q.H.

(Prereq. 02.131 and 12.115)

An introduction to the science and technology of combustion. The fundamental principles of thermochemistry, chemical equilibrium, and

rates of reaction are reviewed and related to combustion processes in heat engines. The principles of combustion waves are introduced, and the mechanisms of various physical and chemical processes in combustion are discussed.

02.134 Direct Energy Conversion 4 Q.H.
(Prereq. 02.131 and 12.115)

This course is concerned with means for converting heat directly into electrical energy. The operating principles of such devices, principally magnetohydrodynamic power generators and fuel cells, are discussed. Other topics, such as energy storage, thermionic converters, and irreversible thermodynamics as a basis for a unified theory of energy conversion may be included.

02.140 Computer-Aided Design 4 Q.H.
(Prereq. 09.108 and 02.168)

The concepts of computational and numerical geometry for design are introduced. The implementation of computer graphics in design and use of computer-aided design packages are included. Principles of numerical control techniques to design and manufacture are covered. A design project is required.

02.145 Design Fundamentals 4 Q.H.
(Prereq. 02.168)

The course focuses on engineering design analysis of dynamically loaded machine elements. Topics include stress concentration; contact and impact stresses; thorough treatment of fatigue factors in design (combined loading and statistical considerations); and environmental factors in design, creep, temperature, and atmosphere.

02.146 Mechanical Engineering Design 4 Q.H.
(Prereq. 02.145)

The course offers project(s), using system approach, that involve all aspects of mechanical engineering. This course is intended to provide students an opportunity to correlate previous courses in design of mechanical systems.

02.147 Engineering Design 4 Q.H.
(Prereq. 02.168)

This course is intended for students who take only one course in design. Design projects vary from year to year, but in general expand and correlate previous courses in design of mechanical systems.

02.148 Design and Analysis 4 Q.H.
(Prereq. 02.146; cannot be taken simultaneously with 02.193 or 02.194)

A project must be of a design nature and must be approved by the faculty member under whom the student will work. A formal report must be submitted to the student's faculty supervisor at the end of the quarter.

02.149 Engineering Analysis 4 Q.H.
(Prereq. 02.168)

The course focuses on the numerical and experi-

mental methods in stress analysis. Analytical techniques include an introduction to the finite element method. Experimental methods include, among others, strain gauge techniques and photoelasticity.

02.150 Heat Transfer I 4 Q.H.
(Prereq. 02.130, 02.155, and 10.156)

The theories that describe conduction, convection, and thermal radiation heat transfer mechanisms are studied. Steady-state and transient conduction problems are discussed in rectangular, cylindrical, and spherical coordinate systems. Electrical analogy and numerical methods are also considered. Convective heat transfer mechanisms are studied, and the concept of the Nusselt-Reynolds Number correlation is introduced. Description of thermal radiation heat transfer between surfaces is discussed.

02.155 Fluid Mechanics I 4 Q.H.
(Prereq. 02.130, 02.167, and 10.155)

The course offers an introduction to the concepts of fluid mechanics: fluid statics, including pressure distribution and forces on submerged surfaces; differential and integral formulations of conservation of mass, momentum, and energy with emphasis on control-volume applications; pipe flow with consideration of head loss, use of the Moody diagram, and analysis of pipe networks.

02.156 Fluid Mechanics II 4 Q.H.
(Prereq. 02.155)

Topics include velocity potential and stream functions; circulation and Kelvin's theorem; two-dimensional, steady irrotational incompressible flow; Karman-Pohlhausen method applied to two-dimensional boundary layers.

02.157 Fluid Machinery 4 Q.H.
(Prereq. 02.155)

The course focuses on the general principles of turbomachinery: definitions of efficiency and a discussion of the requirements for similitude; machine selection to suit particular applications. Both liquid- and gas-handling machines are examined, and performance limits imposed by cavitation and choking are considered.

02.163 Mechanics 4 Q.H.
(Prereq. Electrical engineering majors only)

The course focuses on the study of kinematics and kinetics of rigid bodies, instantaneous equations of motion, work and energy, and impulse and momentum.

02.165 Mechanics I 4 Q.H.

Topics include the concept of vector representation of force and moment; equivalent force systems; centroids and centers of gravity, distributed forces; equations of equilibrium; free body diagrams; applications to trusses, pin-connected frames, and beams; and elementary concepts in friction.

02.166 Mechanics III**4 Q.H.**

(Prereq. 02.165)

Development of problem-solving ability in the fundamentals of dynamics. Topics include kinematics of particles, kinematics of rigid bodies (nonrotating frames), mass moments of inertia, kinetics of particles and rigid bodies (plane motion only) using force, mass, and acceleration.

02.167 Mechanics II**4 Q.H.**

(Prereq. 02.165)

Topics include concept of stress and strain; principal stresses; Mohr's circle, stress-strain diagrams; moment of inertia of areas; stress and deformation of simple members under axial and torsional loads, and stresses in symmetrical beam bending.

02.168 Mechanics IV**4 Q.H.**

(Prereq. 02.167)

Topics include asymmetrical bending; analysis of determinate and indeterminate beams by various methods; and buckling of columns.

02.169 Intermediate Strength of Materials**4 Q.H.**

(Prereq. 02.168)

Topics include analysis of curved beams, rings, and thick-walled pressure vessels; introduction to plane elasticity problems using rectangular and polar coordinate systems.

02.171 Mechanical Vibrations**4 Q.H.**

(Prereq. 02.166)

The course focuses on the study of one-, two-, and multi-degrees of freedom systems using classical, energy, Laplace, mobility, matrix, and computer techniques. A laboratory is included in this course.

02.172 System Analysis and Control**4 Q.H.**

(Prereq. 02.166)

This course provides students the opportunity to gain a theoretical background for analyzing and designing a linear control system. System modeling, linear approximations and their limitations, transfer functions, and block diagramming; applications of the Laplace transform; transient and frequency response; and stability, frequency domain, and root locus techniques are discussed.

02.174 Design for Space Applications**4 Q.H.**

(Prereq. 02.166)

The course includes an exploration of Keplerian motion and transfer dynamics using Battin's solution. Optimization of transfer dynamics with respect to our solar system, and mass optimization, boost, and reentry dynamics are studied. System design is used throughout the course.

02.176 Dynamics

(Prereq. 02.166)

Continued development of problem-solving ability in dynamics. Topics include kinematics of

rigid bodies using rotating frames, kinetics of particles and rigid bodies using work and energy, Introduction of Lagrange's equations, kinetics of particles and rigid bodies using impulse and momentum, and simple gyroscopic motion.

02.192 Measurements and Analysis**4 Q.H.***

(Prereq. 02.130 and 02.167)

Lecture subjects include design of experiments, instrumentation, measurements, data analysis, and report writing. Students apply the principles developed in class to a variety of laboratory experiments. Written reports are required.

02.193 Mechanical Engineering Project I**4 Q.H.***

(Prereq. 02.192; cannot be taken simultaneously with 02.148 or 02.194)

The project may be of an analytical or experimental nature. It must be approved by the faculty member under whom the student will work, and a formal report must be submitted to the student's faculty supervisor at the end of the quarter.

02.194 Mechanical Engineering Project II**4 Q.H.**

(Prereq. 02.192 cannot be taken simultaneously with 02.148 or 02.193)

If a project initiated under course 02.193 is large enough in scope, a second project course may be taken with the approval of the faculty supervisor. A formal report must be submitted to the student's faculty supervisor at the end of the quarter.

02.196 Materials Science**4 Q.H.**

(Prereq. 02.130 and 12.115)

An introduction to materials science for engineers, emphasizing the structure-property-function relation. Topics include crystallography, structure of solids, imperfections in crystals, phase equilibrium, phase transformations, diffusion, and physical properties. A laboratory is included in this course.

02.197 Mechanical Behavior of Materials**4 Q.H.**

(Prereq. 02.196 and 02.167)

The study of the physical basis for the mechanical behavior of solid materials, including elasticity, plasticity, viscoelasticity, and fracture. Application is made to structural alloys and polymers.

02.198 Materials Processing**4 Q.H.**

(Prereq. 02.196)

The course offers a survey of the essential features and materials limitation of various methods for processing materials. Topics include heat treatment (ferrous and nonferrous alloys), casting, forming, joining, and machining.

02.199 Materials Science**4 Q.H.**

(Prereq. 02.130 and 12.115)

An introduction to materials science for engineers, emphasizing the structure-property-function relation. Topics include crystallog-

*Lab fee required.

raphy, structure of solids, imperfections in crystals, phase equilibrium, electrical behavior of metals and semiconductors.

02.232 Engineering Materials 4 Q.H.
(Prereq. 02.196)

This course is concerned with the utilization of materials science in the application and selection of materials. Topics include reactions with environment, i.e., oxidation and corrosion; materials selection criteria; and materials engineering case studies dealing with materials selection and failure analysis.

02.233 Thermodynamics of Propulsion 4 Q.H.
(Prereq. 02.131 and 12.115)

The course focuses on application of the principles of thermodynamics and fluid mechanics to understanding the behavior of propulsion devices. Emphasis is on air-breathing engines such as the aircraft gas turbine and the ramjet. Various engine components, such as inlets, diffusers, compressors, combustors, turbines, and nozzles are discussed.

02.236 Nuclear Engineering I 4 Q.H.*
(Prereq. 02.131)

The course offers a study of nuclear physics emphasizing atomic and nuclear structure, radioactive decay, and nuclear reactions, with particular attention to fusion and fission. The course also examines health physics, nuclear instrumentation, and the production and uses of radioactive isotopes. A general comparison of thermal, fast, and broader reactor types is made prior to a discussion of neutron interactions and their slowing down. The four-factor formula and diffusion equation are developed and applied to one-group theory for bare and reflected thermal reactors. Flux shaping as well as energy production and distribution within the core are discussed.

02.237 Nuclear Engineering II 4 Q.H.
(Prereq. 02.236)

The course focuses on development of two-group theory for thermal reactors and considera-

tion of the physics and safety of fast reactors. Effect of reactivity change, either intentional or accidental, as well as changes due to temperature, fission product build-up, xenon build-up after shutdown, and fuel depletion are discussed. Reactor design considerations involving the interrelation of reactor physics, reactor engineering control, distribution of power, and fuel cycle management are considered.

02.240 Internal Combustion Engines 4 Q.H.
(Prereq. 02.131)

The concepts and theory of operation of internal combustion engines are presented based upon the fundamental engineering sciences of thermodynamics, gas dynamics, heat transfer, and mechanics. The design and operating characteristics of conventional spark-ignition, compression-ignition, Wankel, and stratified charge spark-ignition engines are discussed. Performance analysis using Newhall-Starkman charts and computer programs are included.

02.258 Gas Dynamics 4 Q.H.
(Prereq. 02.155)

Course focuses on application of the principles of fluid mechanics to compressible flows. Wave propagation and the concepts of sound speed and Mach number are discussed. The emphasis is on one-dimensional steady flows with an examination of the effects of area change, friction, and heat transfer, including a consideration of normal shock waves and the possibility of choking.

02.260 Heat and Mass Transfer 4 Q.H.
(Prereq. 02.150)

Heat exchange design is explored by both the logarithmic mean temperature difference (LMTD) and the effectiveness-NTU (number of transfer units) methods. The radiant heat transfer, the nature of solar radiation, and the design of a flat-plate solar collector are discussed.

Electrical Engineering

The course descriptions listed under Electrical Engineering are intended to show the general scope of the subject that will be covered. Since courses are continuously updated, specific topics or methods of approach may vary from term to term.

03.101 Discrete Systems 4 Q.H.
(Prereq. 09.108)

Topics include historical review and future perspectives of discrete systems; representation of digital signals, quantization; introduction to digital filters, moving average filters; Z-transforms, inverse Z-transforms; recursive digital

filters, stability considerations, steady-state and transient response; introduction to non-recursive techniques, the discrete Fourier transform, the fast Fourier transform; applications to computation of systems transfer functions.

*Lab fee required.

- 03.111 Circuits and Systems I** 4 Q.H.
(Prereq. 10.152 and 11.205)
The course covers circuit elements (linear, non-linear, time-invariant, and time-varying), sources (independent and controlled), Kirchhoff's laws, Tellegen's theorem, Thevenin's theorem, network topology, mesh and nodal analysis.
- 03.112 Circuits and Systems II** 4 Q.H.
(Prereq. 03.111)
Topics include linearity and time-invariance, system function, forced and force-free response of networks and LTI systems, singularity response, partial fraction expansion, "pre-box" concept, and convolution.
- 03.113 Circuits and Systems III** 4 Q.H.
(Prereq. 03.112)
Topics include Thevenin's theorem revisited, magnitude and phase plots, resonance, two-port networks, energy and power, and convolution.
- 03.119 Circuits and Systems A** 6 Q.H.
(Prereq. 10.152 and 11.205)
Includes the material covered in course 03.111, Circuits and Systems I, plus half of the material in course 03.112, Circuits and Systems II.
- 03.120 Circuits and Systems B** 6 Q.H.
(Prereq. 03.119)
Completes the material in 03.112, Circuits and Systems II, plus the material in course 03.113, Circuits and Systems III.
- 03.122 Circuits and Systems IV** 4 Q.H.
(Prereq. 03.113)
The course focuses on basic concepts and techniques of linear system theory. Review of system theory in terms of the convolution integral; waveform representation in terms of the Fourier series, Fourier Integral, and the bilateral Laplace transform; system concepts in terms of the function and their application to filters and feedback systems.
- 03.131 E.E. Laboratory I-Measurements** 2 Q.H.*
(Prereq. 03.111)
The course covers basic electrical measurements; report writing, use of standard laboratory instruments, including digital voltmeters, oscilloscopes, and bridges.
- 03.132 E.E. Laboratory II-Circuits and Systems** 2 Q.H.*
(Prereq. 03.112)
The course includes experiments relevant to the Circuits and Systems courses, together with more work in measurements.
- 03.133 E.E. Laboratory III-Devices** 2 Q.H.*
(Prereq. 03.141)
The course includes introduction to the digital computer, electro-optics, terminal characteristics of active devices.

- 03.134 E.E. Laboratory IV** 2 Q.H.*
(Prereq. 03.142 and 03.161)
The course includes logic circuits, design and testing of active circuits, microwave studies, control systems, digital computation.
- 03.146 Electronics A** 4 Q.H.
(Prereq. 03.113; not open to students who have taken 03.141, 03.142, and 03.144)
This first course in electronics stresses the use of transistors in digital integrated circuits. Topics include fabrication and processing of integrated circuits, characteristics of the theoretical physical junction, Ebers-Moll model for bipolar junction transistors, characteristics of bipolar and field-effect devices, basic digital inverters and logic gates, and various logic families (CMOS, TTL, MOS, and I²◀).
- 03.147 Electronics B** 4 Q.H.
(Prereq. 03.146 and 03.122; not open to students who have taken 03.141, 03.142, and 03.144)
This second course in electronics stresses the use of transistors in the design of analog circuits. Much of the emphasis is on integrated circuit devices. Topics covered include biasing, linearized incremental models involving controlled sources, load line techniques, early effect, use of signal flowgraphs for solving circuits, frequency response and gain calculations for single stage and cascaded stages, and differential and operational amplifiers.
- 03.148 Electronics C** 4 Q.H.
(Prereq. 03.147; not open to students who have taken 03.141, 03.142, and 03.144)
This third course in electronics continues the development of analog electronic circuits. Topics include concept of feedback, open- and closed-loop gain, effect of feedback on impedance levels and frequency response, limitations on the performance of operational amplifiers, stability and compensation in feedback systems, analog circuit applications, and an Analog/Digital system design example.
- 03.151 E.E. Laboratory I-A** 1 Q.H.*
(Prereq. 11.205)
The course focuses on basic electrical measurements; report writing; and use of laboratory instruments, including digital voltmeters, oscilloscopes, and bridges.
- 03.152 E.E. Laboratory I-B** 1 Q.H.*
(Prereq. 03.151)
A continuation of 03.151, E.E. Laboratory I-A.
- 03.153 E.E. Laboratory II-A** 1 Q.H.*
(Prereq. 03.152)
Experiments in conjunction with courses 03.111 and 03.112, Circuits and Systems I and II. Additional experiments in measurements.

03.154 E.E. Laboratory II-B 1 Q.H.*
(Prereq. 03.153)

Continuation of 03.153 in conjunction with courses 03.113 and 03.122, Circuits and Systems III and IV.

03.155 E.E. Laboratory III-A 1 Q.H.*
(Prereq. 03.154)

Introduction to the digital computer and logic circuits, as well as experiments tied in with 03.146 and 03.147, Electronics A and B.

03.156 E.E. Laboratory III-B 1 Q.H.
(Prereq. 03.155)

Continuation of 03.155 with some experiments relevant to 03.161 and 03.162, Field Theory I and II.

03.161 Electromagnetic Field Theory I 4 Q.H.
(Prereq. 10.155)

The course focuses on definition and representation of scalar and vector fields. Coordinate systems; elements of vector calculus; definition of the concepts of gradient, divergence, curl, and the "del" operator; free-space electrostatics; definition of the electric field intensity; the scalar potential; solution to Poisson and Laplace equations; macroscopic model of dielectric materials; the electric polarization and the electric flux density vector; boundary conditions; Lorentz force; free space magnetostatics; magnetic vector potential and solution to the "vector" Poisson equation; macroscopic model of magnetic materials; magnetization and magnetic field intensity; boundary conditions.

03.162 Electromagnetic Field Theory II 4 Q.H.
(Prereq. 03.161)

Topics include generalization of the Maxwell equations to the case of time-varying fields; Faraday induction law; wave equations and the plane wave solution; Poynting theorem and the concept of energy stored by the fields; reflection and refraction of plane waves; time-harmonic wave equations for the scalar and vector potentials; time-harmonic form of retarded potentials; radiation from dipole; motion of charged particles in fields; magnetoionic media; elementary discussion of plasma physics and M.H.D.

03.175 Electromechanical Dynamics 4 Q.H.
(Prereq. 03.113, and 03.161)

The course offers review of the Maxwell equations and quasistatic approximations, electric and magnetic energy concepts, state-variable formulation of electromechanical coupling. Applications to elementary energy conversion devices, singly and doubly excited magnetic devices with mechanical, translational, and rotational elements. Generalized rotating electromagnetic energy converters; circuit-model concepts; applications to selected extant rotating machines, i.e., commutator machines

and a-c machines; dynamic response to various stimuli are studied.

03.176 Machines and Systems 4 Q.H.
(Prereq. 03.177)

The course offers a detailed investigation of the operating principles of synchronous machines, synchronous motor and generator power-angle characteristics, machine dynamics, machine and power system stability.

03.177 Introduction to Electric Machinery 4 Q.H.
(Prereq. 03.161)

Topics include review of magnetic field, energy, and energy conversion concepts. Transformers and their circuit representations; application of energy conversion concepts to basic rotating machines and exploration of the Theory of Induction, synchronous, and d-c machines. Limitations in actual machines will be discussed.

03.178 Transients in Electric Power Systems 4 Q.H.

Introduction to the response of various elements of a power network to the transients caused by lightning, switching, and faults. Some of the equipment to be considered in terms of transient response include the transmission line, lightning arresters, fuses, transformers, and circuit breakers.

03.183 Electrical Engineering I 4 Q.H.
(Prereq. 10.152; not open to electrical engineering majors)

Introductory course to electric circuit theory covers Kirchhoff's laws, loop and nodal analysis, Thevenin's theorem, power and energy, exponential excitation, and the system function.

03.184 Electrical Engineering II 4 Q.H.
(Prereq. 03.183; not open to electrical engineering majors)

Properties and analysis of electronic devices, circuits, and systems; elements of control systems; principles of energy conversion. Emphasis on each topic determined according to major discipline.

03.185 Power Systems and Controls 4 Q.H.
(Prereq. 03.183)

Basic concepts of electromechanical energy conversion stressing the terminal characteristics and operation of d-c and a-c machines, elements of power distribution systems, and concepts of feedback control, with application to power systems and plant control.

03.186 Basic Electrical Instrumentation 4 Q.H.*
(Prereq. 03.183)

Basic electrical measurement devices, including ammeters, voltmeters, oscilloscopes, and bridges; instrumentation techniques such as direct measurement, comparative measurement, and analog methods. Application to non-electrical disciplines is included.

03.187 Modelling Techniques 4 Q.H.
(Prereq. 03.183 and 03.184; also FORTRAN IV programming)
Introduction to the concept of modelling techniques to represent physical, biological, and social systems; electrical analogs and use of analog computers; introduction to digital modelling and the use of digital computation.

03.191 Introduction to Digital Computers I: Design and Organization 4 Q.H.
(Prereq. 11.205 and 10.153)
Introduction to the basic components of digital systems and methods for their analysis and design: logic gates and flipflops, Boolean algebra, and combinational and sequential circuits. Integrated circuit logic families and functional building blocks: registers, counters, decoders, multiplexers, and memories. Data representation and coding techniques. Register-transfer language for specification of instruction sets, processor organization, and logic design. Case study of a specific central processor instruction set implementation. Assembly language programming techniques and introduction to system software.

03.192 Introduction to Digital Computers II: Fundamentals of Computation Structures 4 Q.H.
(Prereq. 03.191)
Central processor alternatives; instruction formats, addressing modes, bus structures, arithmetic units, timing analysis, and stacks. Algorithms for arithmetic operations with various data representations. Input-output and memory organization. Introduction to microprocessors. This course, like its predecessor 03.191, is oriented toward the design, not just the comprehension, of digital systems likely to be encountered by the electrical engineer.

03.200 Special Topics 4 Q.H.
(Prereq. Permission of Department)
Topics covered vary from term to term depending on the interests of the Department and the students.

03.204 Microcomputer-Based Design 4 Q.H.
(Prereq. 03.192)
Course material includes characteristics of microprocessor applications; external and internal architecture of a specific microprocessor family; logic design of a simple microcomputer. Instruction set, timing cycles, I/O port selection and interrupt-handling; software design for keyboard monitor, breakpoint facility and multiplexed displays. Application design studies of real-time interfaces to electromechanical devices. Evolutionary trends in LSI microprocessors and memory systems. Integrated hardware and software design projects using laboratory microcomputers are an integral part of this course, which is designed primarily for electrical engineers.

*Lab fee required.

03.218 Control System Theory 4 Q.H.
(Prereq. 03.144)
Control system concepts; goals and basic components. Review of time- and frequency-domain techniques. Classical control system theory; error analysis for different systems. Analysis of second- and third-order systems. Stability and relative stability using root locus and Nyquist diagrams. The Nichols chart. Compensation, application of computer technology to control systems analysis and design. State-variable description of dynamic systems. The state equations and the fundamental analog realization of the standard equations. Properties of the state-transition matrix. Optimal systems. Introduction to sampled data systems. The Z-transform as an analog to the Laplace transform.

03.221 Electrical Power Systems I 4 Q.H.
(Prereq. 03.113)
This course, together with 03.222, Electrical Power Systems II, is designed to give a broad view of the structure of those electric systems having the primary function of energy transfer and especially those that function to transfer large quantities of energy. The functions of the various system elements are described and their significant characteristics are investigated briefly. The interrelation between elements is treated.

03.222 Electrical Power Systems II 4 Q.H.
(Prereq. 03.221)
A continuation of Electrical Power Systems I. Problems such as voltage control, protection, economics, and planning that relate to the system as a whole. Taken with the previous course, it may provide a general background for more intensive studies of electric power systems.
NOTE: A student may take either both electives in sequence or the first course only.

03.233 E.E. Power Laboratory I 2 Q.H.*
The course covers experimental work with polyphase power equipment, power measurements, polyphase power rectification, steady-state and dynamic operation modes of polyphase induction motors, power transformers and symmetrical component analysis of unbalanced loading of transformers, analog computer.

03.234 E.E. Power Laboratory II 2 Q.H.*
(Prereq. 03.246)
The course covers experimental work with rotating machinery and systems; steady-state and dynamic modes of operation of the commutator and synchronous machines; system study involving synchronous machines; selected experiments in control systems; network analyzer studies.

03.237 Senior Project Laboratory I 2 Q.H.*
(Prereq. 03.142 and 03.162)
In this course students work with a faculty adviser on some term project, either experimental or theoretical.

03.238 Senior Project Laboratory II 2 Q.H.*

(Prereq. 03.142 and 03.162)

This course may be a continuation of the project started in 03.237 or it may be a new project. Again, the student works closely with a faculty adviser.

03.241 Selected Topics In Electronics 4 Q.H.
(Prereq. 03.147)

This course concerns (1) the description and application of those electronic devices (thyristors, photodiodes, etc.) not covered in depth in the regular electronics sequence; (2) electronic subsystems (AFC, shift registers, etc.); (3) systems (navigation systems, telephone switching systems, etc.). Most of the presentations are made by students on topics of their choice, but there are also lectures by invited speakers as well as by the instructor.

03.242 Theory and Technology of Semiconductor Devices I 4 Q.H.*
(Prereq. 02.196)

This course comprises a closely coupled lecture and laboratory series. Topics covered include technology and physics of the planar diffusion process, electronic properties of homogeneous semiconductors, inhomogeneities and junctions (Fermi potential diagrams, equilibrium at an abrupt discontinuity, and the behavior of a junction under applied bias), and the junction transistor.

03.243 Theory and Technology of Semiconductor Devices II 4 Q.H.*
(Prereq. 03.242)

This course is a continuation of 03.242. Material covered includes introduction to unipolar transistor action, introduction to surface effects, the MOS-FET, and a discussion of noise problems encountered in semiconductor devices.

03.245 E.E. Power Laboratory A 1 Q.H.***03.246 E.E. Power Laboratory B 1 Q.H.*****03.251 Communication Theory 4 Q.H.**
(Prereq. 03.122)

Topics include signal analysis, including signal classes, Fourier methods, correlation functions, amplitude density, and power spectra; amplitude modulation, Hilbert transform applications, analytic signal, and complex envelope.

03.252 Fundamentals of Communication Systems 4 Q.H.
(Prereq. 03.251)

Topics include frequency modulation, signal-to-noise ratios in AM and FM, multiplexing, sampling theory, pulse modulation systems, data transmission, signal space. Correlation detection, probability, random variables and random processes, information theory, and coding.

03.261 Wave Transmission and Reception 4 Q.H.
(Prereq. 09.108 and 03.161)

Topics include analysis of radiation, transmission, and reception of electromagnetic and acoustic waves using graphical and digital computer techniques. Design of distributed systems, antennas, microphones, loudspeakers, and sonar transducers.

03.262 Advanced Topics In Electromagnetic Field Theory 4 Q.H.
(Prereq. 03.162)

This course is a continuation of the required courses in field theory. Topics covered include microwave and waveguide structures, careful development of electromagnetic energy and force concepts, and an introduction to radiation and antenna theory.

03.281 Machine Language and Assembly Language Programming 4 Q.H.
(Prereq. 03.191)

This course focuses on study of the machine and assembly languages of a selected digital computer. Machine representation of numbers, characters, and instructions. Machine language programming; flow of control, relocatability, input/output instructions, addressing, and instruction modification. Symbolic assembly language; macros, literals, and pseudo-instructions. Several programming projects are an integral part of the course.

03.282 Programming Systems 4 Q.H.
(Prereq. 03.281)

Continuation of 03.281. Assemblers, searching and sorting techniques, macro-processors, loaders. High-level languages and an introduction to their compilation. Introduction to operating systems. Programming projects are an integral part of the course.

03.285 Applied Discrete Analysis 4 Q.H.
(Prereq. 10.155)

The course offers an introduction to elementary number theory, modern algebra, combinatorial mathematics, and discrete probability theory, including such topics as prime numbers, least common multiple, greatest common divisor, Euclid's algorithm, continued fractions, congruences, groups, rings, fields, Boolean algebra, combinations and permutations, generating functions, random variables, and Markov chains. The material in this course is widely applicable to the field of computer science.

03.292 Mathematical Techniques In Electrical Engineering I 4 Q.H.
(Prereq. 10.155)

The goals of this course are: (1) to introduce the basic precepts of the Theory of Complex Variables; (2) to organize and codify the student's understanding of analysis (i.e., the properties of

analytic functions); (3) to augment the student's sensitivity to questions of rigor and the limitations on the applicability of fundamental techniques; (4) to provide an appreciation of nineteenth-century mathematics and those who contributed to it; (5) to suggest applications of the subject matter without being an applications course per se.

Topics, depending on time and student background, include complex numbers and functions of a complex variable; infinite series, uniform continuity, and convergence; Cauchy theorems and formulas; the calculus of residues; conformal representation, integral functions; and special functions.

03.293 Mathematical Techniques in Electrical Engineering II **4 Q.H.**
(Prereq. 10.155 or equiv.)

Topics include matrix notation and development of matrix algebra. The solubility of sets of linear equations; determinants, linear transformations, invariance, quadratic forms and eigenvalues. Illustrative applications of matrix techniques for the formulation and solution of problems are drawn from the realm of circuit theory, probability theory, and engineering physics.

03.295 Numerical Methods and Computer Applications **4 Q.H.**
(Prereq. 09.108 and 03.122)

The course focuses on presentation of numerical techniques used in solving scientific and engineering problems with the aid of digital computers. Topics covered include modeling and simulating of deterministic and probabilistic systems, theory of interpolation, iteration methods, numerical solution of ordinary and partial differential equations, signal detection, and use libraries of scientific subroutines. Representative problems are chosen for solution on a digital computer.

03.296 Digital Techniques **4 Q.H.**
(Prereq. 03.146 and 03.191)

This course attempts to supplement the topics covered in the electronics sequences and the introduction to digital computer courses. Topics may vary from year to year and may include details of semiconductor integrated gate circuits, flip flops, clocks, counters, memory units, A/D and D/A conversions, coding, and the fundamental techniques of digital data transmissions.

Chemical Engineering

The course descriptions listed under Chemical Engineering are intended to show the general scope of the subject that will be covered. Since courses are continuously updated, specific topics or methods of approach may vary from term to term. In addition to meeting course prerequisites, students are expected to take each chemical engineering course in the sequence shown on the specimen program sheet.

04.101 Chemical Engineering Calculations I **4 Q.H.***
(Prereq. 12.115)

This course examines application of fundamental laws of mass and energy conservation to chemical and physical processes. In this course the primary emphasis is on material balances. A computational laboratory is included to aid students in improving facility in handling problems typical of the course.

04.102 Chemical Engineering Calculations II **4 Q.H.**
(Prereq. 04.101)

Emphasis in this course is on energy balances and the simultaneous application of mass and energy conservation laws. Problems selected from those typical of the chemical processing industries are considered.

04.106 Polymer Science and Engineering **4 Q.H.**
(Prereq. 12.147)

This course provides instruction in the nature of polymeric materials and their importance to the chemical industries and everyday life. Topics

include polymer classification, composition, structure, physical properties, chemical properties, and methods of polymer synthesis.

04.111 Chemical Engineering I **4 Q.H.**
(Prereq. 04.102)

The important unit operations of chemical engineering: fluid mechanics, heat transfer, and evaporation are examined.

04.112 Chemical Engineering II **4 Q.H.**
(Prereq. 04.111)

This course is a continuation of 04.111 to mass transfer unit operations: distillation and gas absorption.

04.121 Transport Phenomena I **4 Q.H.**
(Prereq. 04.111)

The mechanisms of momentum transport in fluid-flow phenomena are described. Velocity distributions for Newtonian fluids in the laminar and turbulent flow regimes are derived and utilized in the analysis of elementary fluid-flow problems.

*Lab fee required.

04.122 Transport Phenomena II 4 Q.H.

(Prereq. 04.121 and 04.112)

Mass and heat transport by the mechanisms of molecular and bulk motion are described. A variety of elementary physical and chemical transport problems are analyzed in terms of these mechanisms.

04.123 Experimental Methods I 4 Q.H.*

(Prereq. 04.112)

Experimental approach to solving chemical engineering problems and preparing reports to detail the results and their interpretations. Experiments illustrating the fundamental unit operations are performed.

04.124 Experimental Methods II 4 Q.H.*

(Prereq. 04.123)

A continuation of 04.123, requiring more advanced experimentation and more sophisticated reports.

04.126 Chemical Engineering Thermodynamics 4 Q.H.

(Prereq. 04.102)

Topics include the first law and its application to batch and flow systems, heat effects in chemical and physical processes, thermodynamic properties; the second law, entropy, physical and chemical equilibria; emphasis on the fundamental principles and mathematical relations and their application to the analysis and solution of a variety of engineering problems.

04.131 Process Design I 6 Q.H.*

(Prereq. 04.122 and 04.126)

Process design of a chemical plant. Topics include process selection, material and energy balances, equipment selection and/or design, elements of instrumentation, flowsheets, and cost estimates.

04.132 Process Design II 6 Q.H.*

(Prereq. 04.131)

This course is a continuation of 04.131. A more complex design is required. Additional elements of process design are studied.

04.133 Projects I 6 Q.H.*

(Prereq. Senior standing and consent of Dept.)

This course offers individual research related to some phase of chemical engineering. Open only to students selected by the Department head on the basis of scholarship and proven ability.

04.134 Projects II 6 Q.H.*

(Prereq. 04.133)

The course offers a continuation of the research work undertaken in 04.133.

04.135 Principles of Nuclear Engineering 4 Q.H.

(Prereq. Senior standing)

The course offers an introduction to the principles of nuclear engineering. Elements of nuclear physics, reactor physics, and radiation safety are presented together with engineering techniques specific to the nuclear industry.

04.136 Chemical Engineering Kinetics 4 Q.H.

(Prereq. 04.126)

Topics include fundamental theories of the rate of chemical change in homogeneous reacting systems; integral and differential analysis of kinetic data; design of batch and continuous-flow chemical reactors; introduction to heterogeneous reactions and reactor design.

04.137 Mathematical Methods in Chemical Engineering 4 Q.H.

(Prereq. Senior standing)

The course examines formulation and solution of problems taken from chemical and engineering studies that require advanced mathematical methods. Emphasis is placed primarily on the formulation step, although numeric and analytic solution techniques for solving sets of algebraic equations and for solving ordinary and partial differential equations are discussed.

04.138 Chemical Process Control 4 Q.H.

(Prereq. Senior standing)

The course focuses on principles of automatic control with applications to chemical processing systems. Topics such as process modeling and control system design are included.

04.142 Introduction to Optimization 4 Q.H.

(Prereq. Senior standing)

Elementary optimization techniques, such as gradient methods, pattern search, linear programming, and dynamic programming, are described and applied to a variety of elementary physical and chemical problems.

04.143 Special Topics 4 Q.H.

(Prereq. Senior standing)

Chemical engineering topics of interest to the staff member conducting the class are presented for study.

04.144 Chemical Energy Economics 4 Q.H.

(Prereq. Senior standing)

Financial decision-making techniques are introduced and applied to the problems of production, transportation, and utilization of chemical energy resources such as petroleum, natural gas, coal, and shale oil.

04.145 Mass Transfer Operations 4 Q.H.

(Prereq. Senior standing)

Course focuses on calculation and design methods used in processes involving mass transfer. Topics covered include vapor-liquid equilibria for binary and multicomponent systems, multicomponent distillation, absorption, and extraction.

04.147 Analysis of Chemical Processes 4 Q.H.

(Prereq. 04.126, 04.136, and senior standing)

Course focuses on methods and reactions used for making chemical products on a large scale. Topics covered include types of physical and chemical equilibria, flow-sheet patterns, energy

management, and catalytic and noncatalytic rate problems. A number of situations involving simultaneous application of the above topics in process analyses are studied.

04.148 Management in the Chemical Industries 4 Q.H.

(Prereq. Senior standing in engineering)

The course focuses on principles of management as applied to the chemical process industries. Case studies are used to supplement lectures and discussion.

04.149 Kinetics of Polymerization Process 4 Q.H.

(Prereq. 04.136, 12.148, and senior standing)

The course focuses on the mechanisms by which polymeric materials are assembled via chemical reaction. Reaction-rate models based on these mechanisms are utilized to investigate the effect of reaction parameters on the chemical and physical structure of the polymeric product. The specific polymerization processes considered are free radical addition, condensation, and ionic.

04.152 Pollution Control in Chemical Industries 4 Q.H.

(Prereq. Senior standing)
Students are instructed in fundamental operations for handling environmental problems

in the chemical process industries. Water quality requirements and industrial waste characteristics are discussed.

04.154 Chemical Process Development 4 Q.H.
(Prereq. Senior standing)

The course offers a study of the manner in which a chemical process evolves from the research laboratory to full-scale production. Typical processes are used as illustrations. Topics covered include economic factors, safety factors, batch vs. continuous operation, process evaluation, developing the flow sheet, and scale-up considerations.

04.155 Corrosion Engineering 4 Q.H.
(Prereq. Senior standing)

The course covers the fundamentals of corrosion engineering: theories of corrosion, corrosion testing, corrosion protection, and selected relevant topics.

04.481 Nuclear Technology 4 Q.H.
(Prereq. 10.422, 11.319 BET only)

Topics include atomic and nuclear structure, nature of radioactivity, radiological safety, use of nuclear instrumentation, and elements of nuclear reactors.

Industrial Engineering

The course descriptions listed under Industrial Engineering are intended to show the general scope of the subject that will be covered. Since courses are continuously updated, specific topics or methods of approach may vary from term to term.

05.127 Concepts and Applications of Work Design 4 Q.H.

(Prereq. Not open to industrial engineering majors)

The course focuses on methods design concepts and graphic aids for analysis, including process, multiple activity, and operations charts; work measurement techniques, including stopwatch time study, work sampling, and pre-determined time systems. Analysis methods are illustrated with examples drawn from production processes and service industries. The course is structured to assist students in developing the ability to identify and solve minor problems and to assess the need for and quality of outside expert assistance.

05.128 Work Design 4 Q.H.
(Prereq. 05.127)

Topics include principles of work physiology; workplace design from the standpoint of employee safety and effectiveness; work measurement techniques, including direct measurement, synthetic standards, and work sampling.

05.130 Systems I 4 Q.H.
(Prereq. 10.154)

Topics include linear feedback systems and solutions of first-order systems; integral and derivative control; Laplace transforms for continuous systems analysis and Z-transforms in discrete systems; transfer functions; use of the DYNAMO language to simulate complex feedback systems.

05.131 Systems II 4 Q.H.

(Prereq. 05.145, 05.240, and 05.161)

The course examines analysis and design of major industrial engineering systems. Students are expected to undertake up to five projects drawn from line balancing, job shop scheduling, stochastic network analysis, reliability in design, complex queuing system design, sequencing, or other areas of student and faculty interest.

05.145 Probabilistic Analysis for Engineers 4 Q.H.

(Prereq. Integral & Differential Calculus)

Probability theory presented axiomatically, with emphasis on sample space representation of continuous and discrete random variables. Material will cover standard distributions. Topics include expectation, transform techniques, and change of variable.

05.147 Statistics I 4 Q.H.

(Prereq. 10.208)

The course examines definition of a statistic; distributions of random variables, including normal, t, chi-square, F, poisson, binomial; estimation of parameters, point estimation by method of moments, maximum likelihood, and Bayes estimates.

05.148 Statistics II 4 Q.H.

(Prereq. 05.147)

Topics include interval estimation, stating and testing hypotheses, linear regression, analysis of variance, applied topics such as reliability and decision theory from Bayes rule.

05.149 Reliability and Quality Control 4 Q.H.

(Prereq. 05.147)

Applied probability and statistical inference techniques are utilized in reliability analysis and quality control. Both theory and application are discussed in relation to the total quality assurance program.

05.150 Industrial Cost Control 4 Q.H.

Topics include fundamental concepts of accounting, with emphasis on using financial records to make engineering decisions. Study of financial statements of a firm. Contrast in usefulness of data from absorption costing vs. direct costing. Interpretation of variance accounts.

05.161 Operations Research I 4 Q.H.

(Prereq. 10.154)

Topics include deterministic models, including LP and duality; transportation and allocation; sensitivity and post-optimality analyses. Network analysis, including maximal flow, shortest route, and PERT; dynamic programming and recursive functional expressions; game theory.

05.163 Operations Research II 4 Q.H.

(Prereq. 05.147)

The course focuses on the stochastic models in OR; their analytical development and solution.

Topics covered include queuing, models, deterministic and stochastic inventory models, Markov chains, and sequencing.

05.165 Production and Inventory Control 4 Q.H.

(Prereq. 05.145 or equiv.)

Topics include basic inventory models and inventory management systems. Single-stage and multi-stage systems and their dynamics. Production control and aggregate planning. Mathematical and heuristic approaches to aggregate scheduling. Cost structure and decision-oriented analyses. Consideration of job shop scheduling and dispatching problems.

05.166 Facilities Design 4 Q.H.

(Prereq. 05.161)

The course examines use of descriptive and optimizing models (e.g., simulation, queuing theory, and linear programming) to design facilities and associated materials-handling systems. Computer-assisted layout analysis techniques are applied to problems of real-world scope.

05.167 Material Handling System Design 4 Q.H.

(Prereq. 05.161)

The course covers design and analysis of large material-handling systems. Topics include computer control of handling systems, integration with production and inspection, automated storage/retrieval systems, automatic identification systems, and systems acquisitions.

05.170 Human Considerations In Engineering Design 4 Q.H.

This is an introductory human factors course with emphasis upon the physiological and anthropometric bases of equipment and workplace design. Topics include: (1) thermal regulation and heat stress; (2) work and fatigue; (3) acceleration and whole-body vibration stress; (4) ambient noise and auditory system damage; (5) body measurements and equipment design. As feasible, theory is related to student experiments.

05.171 Human Factors 4 Q.H.

This is an introductory course with emphasis upon human sensory/motor performance and information-processing capabilities. Includes application to the design and performance of human/machine systems. Topics include: (1) function and performance of the visual and auditory senses; (2) concepts of information theory and signal-detection theory; (3) cognitive channel capacity and selective attention. The course is built around a series of experiments that explore theories of human performance in skilled-task execution.

05.186 People In Organizations 4 Q.H.

(Prereq. Seniors only)

Topics include the individual in the work environment; work theory, motivation, and interpersonal relations based on the concepts of the

behavioral sciences; structure and dynamics of organizations; problems of innovation; case studies for situational analysis to assist students who wish to develop skill in applying behavioral concepts.

05.201 Principles of Computation and Programming I

4 Q.H.

(Prereq. FORTRAN)

The course covers review of algorithms, computers, and programming. Machine language programming (instruction, execution, and addressing techniques). Coding and representation of data. Program debugging and verification. Survey of machines, devices, and languages.

05.240 Digital Simulation Techniques

4 Q.H.

(Prereq. FORTRAN and 05.147 or 05.245)

The course covers design and construction of digital, discrete simulation models. Extensive use of FORTRAN and GPSS simulation language. Discussion of model logic and specification, testing, validation, and use. Several simulation projects using the North-eastern computer facilities.

05.241 Management Information Systems

4 Q.H.

Topics include managerial applications of digital computers; the use of computers in information, decision-support systems; information-based theories of management; survey of information technology; computer system basics; cost and value of information; system design, analysis, equipment selection; organizational implications.

05.245 Basic Engineering Statistics

4 Q.H.

(Not open to industrial engineering majors)

The course covers introduction to basic probability distributions, including the binomial and hypergeometric, exponential, Poisson, and normal; laboratory data analysis.

05.260 Engineering Economy

4 Q.H.

(Not open to industrial engineering majors)

Topics include the formulation of analytical techniques, i.e., rate of return, present worth, and annual cost. The application of these techniques to solve business and engineering problems involving design, selection, replacement, lease-buy decisions, and decisions between multiple alternatives. Sensitivity analysis and basic probability are introduced in cases where uncertainty exists. Brief survey of sources and costs of capital, debt-versus-equity financing, and leverage.

05.261 Engineering Economy and Statistical Decision Theory

4 Q.H.

(Prereq. 05.145 or 10.208)

The objective of the course is to familiarize the student with the theory and techniques of economic evaluation of an investment project. Introductory steps in the analysis of investment proposals, time value of money, and cash flows; analysis of deterministic and stochastic cash flows in terms of present worth, annual cost, rate of return, and benefit/cost ratio. Decision tree for sequential decisions, criteria for decision making under uncertainty, utility theory, value of information, effect of accounting procedures and taxes on investment analysis. Case studies involving replacement, lease, engineering design, and public projects.

05.290 Independent Study in Industrial Engineering

1-4 Q.H.

Independent study on advanced I.E. topics for students usually in their senior year and with high scholastic standing. Projects may be of an applied or theoretical nature; formal report submitted to student's project supervisor at the end of quarter.

Computer Science

06.100 Computer Science I

4 Q.H.

The objectives of this course are to introduce problem-solving methods and algorithm development, and to allow students the opportunity to learn a widely used high-level language and how to design and document programs using good programming style. Topics include computer organization, with an overview of computer components and their function; programming languages and programming, including representation of integers, reals, characters, and instructions; data types, constants, variables; assignment statement; logical expressions; sequencing, alteration, and iteration; arrays, sub-programs, and parameters; simple I/O; programming projects emphasizing good

programming style; algorithm development, including the techniques of structured programming; flow charting, stepwise refinement; simple numerical examples; algorithms for searching, sorting, and merging ordered lists. Examples are taken from such areas as business applications and simulations involving games; introduction to recursion; introduction to using software packages such as graphic software.

06.101 Computer Science II

4 Q.H.

(Prereq. 06.100)

The objectives of this course are to continue the development of discipline in program design, style, and expression, and in debugging and testing; to introduce algorithm analysis; and to introduce basic aspects of string processing,

recursion, internal sort/search methods, and simple data structures. Topics include review of good programming style, expression, and documentation; structured programming concepts such as control of flow, invariant relation of a loop, stepwise refinement of both statements and data structures or top-down programming; string processing, including concatenation, substrings, and matching; internal searching and sorting methods such as binary, radix, shell, quicksort, merge sort, and hash coding; data structures such as linear allocation and linked allocation; recursion, including recursive algorithms and data structures.

06.110 Programming Language Lab I **1 Q.H.**
(Prereq. 06.100 and 06.101)

The course offers an introduction to the elements of FORTRAN programming, including I/O, subprogram linkage, and methods of structured programming in FORTRAN.

06.111 Programming Language Lab II **1 Q.H.**
(Prereq. 06.110)

Course materials include elements of job control language; procedure files and parameter exchange; device handling for both tapes and disks; detailed coverage of the job control language for the computer at the Academic Computer Center.

06.112 Programming Language Lab III **1 Q.H.**
(Prereq. 06.111)

The course focuses on elements of list languages.

06.130 Assembly Language I **4 Q.H.**
(Prereq. 06.101 or permission of Instructor)

An introduction to the basic concepts of computer programming on the assembly-language level, this course includes machine organization; data and instruction representation; machine language programming; addressing mode; indexing; instruction set; symbolic assembly language; macros, pseudo-ops, and assembly options.

06.131 Assembly Language II **4 Q.H.**
(Prereq. 06.130)

This course is a continuation of 06.130. Topics include I/O programming; interrupts and re-entrant programming subprogram linkage; independent assembly of subprograms; linkage with higher-level languages; device management asynchronous programming; and an introduction to assemblers and loaders.

06.201 Data Structure **4 Q.H.**
(Prereq. 06.101)

Course material includes basic information structures for representing and manipulating data in computer programming: arrays, lists, stacks, queues, deques, trees, binary trees; applications to nonnumeric computations and problems in compiler construction; searching

and sorting methods and their relative merits. Students are required to write programs to implement these structures on a computer.

06.210 Computer Graphics **4 Q.H.**
(Prereq. 06.201 and 10.246)

The course focuses on characteristics and programming of output devices; point and line drawing, two-dimensional displays, clipping and windowing. Pictures: the data structures and organization of display files. Interaction: graphical input and external events—operating system considerations. Some three-dimensional drawing is also included.

06.220 File Processing **4 Q.H.**
(Prereq. knowledge of COBOL or 09.140)

Because this course makes use of COBOL, students are expected to have command of the fundamentals of that language. Topics include generating reports; manipulating sequential, indexed-sequential, and direct/relative data files on magnetic tape and disc; record blocking; searching, sorting, updating, purging, and merging operations; random access techniques; introduction to data base management concepts.

06.225 Data Base Management Systems **4 Q.H.**
(Prereq. 06.201)

Course material includes data models, data languages, DBMS facilities; schema, sub-schema, data independence; hierarchical, network, and relational systems; implementation considerations, searching, inverted files; operational requirements; performance, integrity, security, utility; survey and comparison of existing systems.

06.230 Operating Systems **4 Q.H.**
(Prereq. 06.131, 06.201, and 03.192)

This course is intended to give the student an overall understanding of the primary principles and elements of operating systems, including the concept of an operating system; functions of the operating system; processes; processor allocation; memory management; virtual memory; I/O programming; multiple processors; interrupt processing device management; information management, including file access, file protection, and file maintenance; and the design and implementation of an operating system.

06.240 Analysis of Programming Languages **4 Q.H.**
(Prereq. 06.201, 06.110, and 06.111)

This course takes up basic issues in programming language design, including efficiency of execution; static checks possible; structured programming; static, stack, or heap allocation for control and data structure; security; arithmetic; parallelism and synchronization modularity; verification; standardization; clarity and completeness of definition, definition methods, extensibility. This course examines existing

languages, such as: Lisp, Scheme, planner, Algol 60; PASCAL, Modula; Algol 68, Mary; ADA; assembler; ML/1 and Stage 2 macro processors (other languages may be added, some deleted); Snobol; PL/1; Sail, or other purely applicative language, maybe ISWIM, others; Lambda calculus, typed and untyped; COBOL.

06.250 Automata and Formal**Language****4 Q.H.**

(Prereq. 10.210 and 06.201)

Topics include finite-state machines and regular expressions; context-free grammars; parsing of context-free languages; context-sensitive grammars, pushdown stores, stack machines and linear-bounded automata; turing machines, undecidability, description of computation using list structures, program machines, and programs.

06.260 Compiler Design I**4 Q.H.**

(Prereq. 06.131, 06.201, 06.110, 06.111, and 06.112)

The purpose of this course is to offer the student the opportunity to become acquainted with the basic mechanisms involved in programming language implementation, including an overview of compilers, translators, and interpreters and their implementation through parsing, verification, optimization, code generation, and execution. Topics include finite automata; lexical analysis; syntactic specification of programming languages; context-free grammars; affixes; basic parsing techniques; run-time storage administration; syntax-directed translation; type checking and conversion; statement translation; symbol tables; error detection and recovery; local code generation and optimization.

06.265 Analysis of Algorithms**4 Q.H.**

(Prereq. 10.210 and 06.201)

This course introduces the basic principles and techniques for analyzing algorithms. Topics include algorithms on sorting, searching, graphs, and digraphs (such as minimal spanning tree, shortest path, depth-first-search, components of a graph); methods involving string matching, computations on polynomials and matrices. Finally, students are introduced to the concept of NP-complete problems.

06.280 Artificial Intelligence**4 Q.H.**

(Prereq. 06.201)

The course focuses on analysis of current computer algorithms dealing with problems such as theorem proving, chess playing, general problem solvers, robotics, symbolic computation, preceptrons, self-reproducing automata, and parallel machines.

06.291 Computer Science Project**4 Q.H.**

(Prereq. Computer science seniors only)

Based upon a student-generated project proposal, students are assigned to appropriate faculty members for developing and completing a computer science project. The nature of the project will reflect the interest and experience of the student.

06.295 Computer Science Seminar**4 Q.H.**

(Prereq. Computer science seniors only)

This course acts as a "capstone" course for computer science majors. Meetings are held once or twice per week and a current topic or problem in computer science is presented by an expert in the subject matter. Students are assigned additional questions and/or problems to research in the topic area as an aid to their developing a deeper appreciation and understanding of various aspects of computer science.

Engineering Technology**Mechanical Engineering Technology****02.411 Mechanics A****4 Q.H.**

(Prereq. 10.420 or 10.620; 11.417 or 11.617)

Topics include forces, moments, couples, statics of particles and rigid bodies in two and three dimensions. Distributed forces: external and internal. First moments and centroids. Analysis of structures: trusses, frames, and machines.

02.412 Mechanics B**4 Q.H.**

(Prereq. 02.411 or 02.611)

Topics include friction, second moments, and virtual work. Kinematics of particles; rectilinear and curvilinear motion of dynamic particles. Force, mass, and acceleration; work and energy.

02.413 Mechanics C**4 Q.H.**

(Prereq. 02.412 or 02.612)

Topics include impulse and momentum of particles. Kinematics and dynamics of rigid bodies: force, mass, and acceleration. Dynamics of rigid bodies: work and energy, impulse and momentum. Introduction to mechanical vibration.

02.414 Stress Analysis A**4 Q.H.**

(Prereq. 02.411 or 02.611)

Topics include axially loaded members; stress and strain, allowable stresses, factor of safety, temperature effects, indeterminate members; thin-walled pressure vessels; centric loading of

bolted and welded connection; shear and moment in beams; eccentrically loaded connections; flexural and transverse shearing stresses in beams.

02.415 Stress Analysis B **4 Q.H.**
(Prereq. 02.414 or 02.614)

Topics include determinate and indeterminate beam deflections and reactions by numerical and graphical integration and area moment methods; theorem of three moments. Torsional stresses and strains; power transmission; eccentric loads on struts, beams, riveted and welded joints; combined and principle stresses; Mohr's circle; theories of failure.

02.416 Stress Analysis C **4 Q.H.**
(Prereq. 02.415 or 02.615)

Topics include curved beam, asymmetrical bending of beams, shear-center and shear stresses on thin sections, composite beams. Columns, energy absorption and resilience, inertial stresses, impact loading, deflection of beams by energy methods.

02.419 Mechanics **4 Q.H.**
(Prereq. 10.420 and 11.417)

Kinematics of particles: rectilinear and curvilinear motion of dynamic particles. Force, mass, and acceleration; work and energy. Impulse and momentum of particles. Kinematics and dynamics of rigid bodies: force, mass, and acceleration. Dynamics of rigid bodies: work and energy, impulse and momentum.

02.421 Thermodynamics A **4 Q.H.**
(Prereq. 11.418 or 11.618)

Topics include general theory of heat and matter, laws of thermodynamics, energy-transformation principles; availability of energy; properties and processes for pure substances and ideal gases. Thermodynamic properties and processes of liquids and vapors; tables and charts; mixtures of fluids; vapor cycles.

02.422 Thermodynamics B **4 Q.H.**
(Prereq. 02.421 or 02.621)

The course covers theory of vapor engines and analysis of actual engine types using gas and vapor compression; internal combustion engines; theory of gas and vapor flow through orifices and nozzles; principles of gas compression; analysis of vapor compression; refrigeration systems; low-temperature refrigeration cycles; and absorption refrigeration systems.

02.423 Refrigeration and Air Conditioning **4 Q.H.**
(Prereq. 02.422 or 02.622)

The course focuses on air conditioning principles, including psychometrics and heat pumps. Course covers calculation of heating and cooling loads in accordance with A.S.H.R.A.E. practices; principles of gas compression; analysis of vapor compression;

refrigeration systems; low-temperature refrigeration cycles; and absorption refrigeration systems.

02.430 Heat Transfer **4 Q.H.**
(Prereq. 02.422 or 02.622)

Topics include the primary modes of heat transfer; thermal conductivity; thermal conductance/resistance concept; thermal-electrical analogy; combined heat-transfer mechanisms; basic equations of conduction; analytical solutions of various steady-state conduction problems. The course also covers dimensional analysis and similarity considerations; natural and forced convection; hydrodynamic and thermal boundary layers; black-body radiation; Kirchhoff's law; emissivity and absorptivity; radiation between simple bodies; numerical methods; log mean temperature differences; overall heat-transfer coefficients; heat exchanger effectiveness; tubular exchanger design; regenerative and evaporative heat exchangers; heat-transfer engineering problems.

02.431 Materials A **4 Q.H.**

Lectures on fundamental metallic structures; general metallurgical information covering theoretical aspects of properties, testing, and failure of metals. Supplemented by visual aids. Lectures on alloying and hardening of metals, refinement of metals, equilibrium diagrams, characteristics of engineering metals, principles of metal fabrication.

02.432 Materials B **4 Q.H.**
(Prereq. 02.431 or 02.631)

The course focuses on the study of inorganic materials (polymers, glasses, ceramics, cements, wood) and materials having important electrical and magnetic properties. A summary of the most recent applications for the fabrication and uses of both metals and nonmetals. Structures of metals, imperfections, phase diagrams, effect of temperature on structure and properties of metals (annealing, recrystallization, recovery, precipitation, diffusion), strengthening mechanisms, mechanical properties of nonferrous metals. Laboratory: experiments in preparation of samples, selection, polishing, and etching; examination of nonferrous metals, use of the microscope, linear analysis, construction of cooling curves, and simple binary phase diagrams.

02.433 Applied Metallurgy **4 Q.H.**
(Prereq. 02.432 or 02.632)

Lectures include mechanical properties of ferrous metals; the iron-carbon diagram; high-temperature alloys, hardening methods, impact tests, effects of environment on metals. Manufacturing processes; methods of fabrication, limitations on the use of different materials and their processing, casting, welding, cutting, drawing, powder metallurgy. Laboratory: includes experiments on analysis of stress-strain

diagrams of iron and steel, heat treatment of steels; surface corrosion; tempering and drawing; use of metallograph and analysis of the results. Experiments in cold rolling, swagging, drawing of nonferrous metals, and analysis of the results. Tension, shear, fatigue, and machinability tests on ferrous metals.

02.443 Fluid Mechanics A **4 Q.H.**
(Prereq. 02.412 or 02.612)

Topics include hydrostatics; principles governing fluids at rest; pressure measurement; hydrostatic forces on submerged areas and objects; simple dams; fluids in moving vessels; hoop tension; fluid flow in pipes under pressure; fluid energy, power, and friction loss; Bernoulli's Theorem; flow measurement.

02.444 Fluid Mechanics B **4 Q.H.**
(Prereq. 02.433 or 02.643)

The course covers pipe networks and reservoir systems; flow in open channels; uniform flow; energy, friction loss, minor losses, velocity distribution, alternate stages of flow, critical flow; nonuniform flow; accelerated and retarded flow; hydraulic jump and waves.

02.451 Mechanical Vibrations **4 Q.H.**
(Prereq. 02.413, 02.613)

Elements of vibrating systems; one degree of freedom (undamped free and forced vibration from Newton's law of motion and energy methods); natural frequencies; damped free and forced vibration; impedance and mobility; systems with more than one degree of freedom; influence coefficients, Lagrange's equations, generalized coordinates, vibration absorber.

02.452 Experimental Stress Analysis **4 Q.H.**
(Prereq. 02.415 or 02.615)

Theory and experimentation showing the application of extensometers and electrical strain gauges as transducers in the field of experimental stress and strain analysis. Theory and laboratory practice; photoelastic methods as applied to classical model analysis and modern coating analysis.

02.461 Machine Shop **4 Q.H.**
Introduction to study of machines for metal processing, cutting tools, and fluids. Machinability, automatic machinery.

02.473 Measurement & Analysis Lab. **2 Q.H.**
(Prereq. 02.414 or 02.614; 06.400 or 06.600; 10.422 or 10.622; 11.419 or 11.619)

The course includes experimental procedures for the collection and analysis of data by graphical and numerical methods including computer applications, report writing that draws conclusions relative to accuracy, precision, true values, and measured values as they relate to basic mechanical measuring instruments for length, area, volume, specific gravity, pressure, temperature, and time as these parameters are utilized in making mechanical measurements.

02.474 Technology Lab A **2 Q.H.**
(Prereq. 02.473 or 02.673; 02.415 or 02.615; 02.431 or 02.631; or concurrently)

The course includes experimental procedures to determine mechanical properties of materials under tensile, compressive, torsional, direct shear, flexural, impact, fatigue, and creep loading conditions as they are affected by normal and abnormal environmental conditions; also as they are affected by homogeneity, non-homogeneity, isotropy, and non-isotropy.

02.475 Technology Lab B **2 Q.H.**
(Prereq. 02.473 or 02.673; 02.443 or 02.643; or concurrently)

The course includes experimental procedures to determine the physical properties of incompressible fluids and to measure the flow rates and velocities utilizing pilot tubes, orifice plates, venturii and weirs flow meters, U-tube differential manometers, and piezometers as the fluid flows through open channels, partially filled conduits, conduits under pressure, pipe networks, turbines, and pumps.

02.476 Technology Lab C **2 Q.H.**
(Prereq. 02.473 or 02.673; 02.422 or 02.622; or concurrently)

The course covers basic thermodynamic relations; experimental procedures to examine the flow of compressible fluids and steam, and the energy conversion of a fuel into a working substance and the related heat-transfer mechanisms. Operating characteristics of thermal generators, engines, and compressors.

02.477 Technology Lab D **2 Q.H.**
(Prereq. 02.476 or 02.676; 02.422 or 02.622; 02.430 or 02.630; or concurrently)

The course includes experimental procedures to examine the operating characteristics and efficiencies of internal combustion engines, brake horsepower, indicated horsepower, friction horsepower, mean effective pressure, fuel consumption, torque, ignition timing, manifold pressure, and compression ratios and internal engines as energy conversion systems; energy conversion of fuels.

02.478 Technology Lab E **2 Q.H.**
(Prereq. 02.473 or 02.673; 02.423 or 02.623; 02.430 or 02.630)

The course includes experimental, analytical, and design projects to examine refrigeration, air conditioning, and heating-pump cycles.

02.479 Power Generation **4 Q.H.**
(Prereq. 02.422 or 02.622)

Topics include basic power generation cycles; gas turbine cycles; effects of combustor temperature, intercooling, etc., on cycle performance; Rankine regenerative cycles; effects of steam temperature, pressure, number of

feedwater heaters, etc., upon performance; steam generation equipment: boilers, reactors.

The course also covers fossil fuel characteristics and effects on boiler design; combustion analysis; draft calculations; axial and centrifugal fan performance characteristics; pump design and performance consideration; heat-exchanger design considerations.

The course also includes applications of principles of economics to cycle and performance considerations; use of load curves; economic considerations of heat rate; economics of equipment selection; study of auxiliary equipment such as precipitators and flue-gas desulfurization systems.

02.480 Mechanical Design A 4 Q.H.
(Prereq. 02.415 or 02.615; 02.431 or 02.631)

The course covers introduction to mechanical design, the design process, design factors,

creativity, optimization, human factors, value engineering. These principles are discussed and developed through simple design projects. Principles of design, properties and selection of materials; stress concentrations; strength under combined stresses; theories of failure; impact and fluctuating and repeated loads.

02.481 Mechanical Design B 4 Q.H.
(Prereq. 02.480 or 02.680)

Topics include stresses; deformation and design of fasteners, screws, joints, springs, and bearings; lubrication and journal bearings. Stresses and power transmission of spur, bevel, and worm gear; shaft design; clutches and brakes.

02.499 Special Problems in Mechanical Engineering Technology 4 Q.H.

(Prereq. Consent of Department Chairperson)
Theoretical or experimental work under individual faculty supervision.

Electrical Engineering Technology

03.410 Electrical Measurements 4 Q.H.
(Prereq. 03.453)

The course covers standards of measurements; dimensional analysis; errors and measurement of dispersed data; discrete and continuous variables; binomial distribution; normal distribution; guaranteed error; methods of resistance measurements; digital voltmeters and analog to digital conversion; voltage references; potentiometers and a-c bridges.

03.411 Electronics I 4 Q.H.
(Prereq. 03.452)

Topics include semiconductor diodes and applications, transistor-biasing techniques, graphical analysis of basic amplifiers, d-c and a-c load lines.

03.412 Electronics II 4 Q.H.
(Prereq. 03.411)

Topics include small-signal, low-frequency transistor models; gains and impedances at midband; frequency effects in transistor circuits; multistage circuits; transistors used as current sources.

03.413 Electronics III 4 Q.H.
(Prereq. 03.412)

The course covers review of Bode plots, transistor circuits at low and high frequencies, feedback operational amplifiers, differential amplifiers, applications.

03.414 Pulse & Digital I 4 Q.H.
(Prereq. 03.411)

The course covers switching characteristics of semiconductor devices; wave generation and shaping, using combinations of passive and integrated circuit components; comparators,

hysteresis, and the dual ramp analog to digital converter-voltmeter circuits; voltage-to-frequency conversion.

03.415 Pulse & Digital II 4 Q.H.
(Prereq. 03.414)

Topics include digital operations; logic statements and theorems; minimization of logic functions; logic gates and the characteristics of the integrated logic families; flip-flops, counters and registers; introduction to sequential circuit design; sample and hold circuits; analog to digital conversion.

03.417 Principles of Communication Systems I 4 Q.H.
(Prereq. 03.413)

Topics include signal analysis using Fourier methods; noise in communication systems; frequency selective amplifiers, including wideband; transistor power amplifiers AF and RF; oscillators; signal sources and applications.

03.418 Principles of Communication Systems II 4 Q.H.
(Prereq. 03.417)

The course covers basic theory of amplitude, frequency, phase and pulse code modulated systems; analysis of modulating and demodulating circuits; carrier systems using SSB; system block and level diagrams; logic control circuits in communication systems; modems.

03.419 Principles of Communication Systems III 4 Q.H.
(Prereq. 03.418)

The course covers fundamentals of digital communications; sampling requirements; analog-to-digital conversion methods; system capacity and bandwidth; comparison of practical digital systems PAM, PCM, PFM, PWM; time and frequency division multiplexing; data decoding;

selected examples from telemetry and computer links.

03.420 Electricity and Electronics I 4 Q.H.
(Prereq. 10.420 and 11.419)

The course covers introduction to circuit analysis, resistive networks, periodic excitation function, steady-state a-c circuits; the physical foundations of electronics and the physical operation of electronic devices.

03.421 Electricity and Electronics II 4 Q.H.
(Prereq. 03.420)

The course covers single-stage electronic circuits, magnetic circuits and transformers, electro-mechanical energy conversion, d-c machines, a-c machines.

03.423 Electronic Laboratory 2 Q.H.
(Prereq. 03.412 or concurrently)

The course covers experiments dealing with laboratory equipment (meters and oscilloscopes) techniques; junction and field-effect transistor characteristics; vacuum and semiconductor diodes; power supplies, including the regulated type; silicon-controlled rectifiers; resistance-coupled amplifiers using transistors, including feedback methods.

03.424 Circuits Laboratory I 2 Q.H.
(Prereq. 03.451)

The course covers experimentation in electronic circuit theory utilizing various measurement techniques. Instrumentation verification of circuit theorems; response of circuits to steps and impulses; oscilloscope theory and applications.

03.425 Circuits Laboratory II 2 Q.H.
(Prereq. 03.424)

The course offers further experimentation in electrical circuits and measurement techniques. Experiments include response of circuits to steps and impulses, nonlinear devices, terminal characteristics of active devices, log modulus plots, network parameters and synthesis. Fourier analysis and synthesis.

03.427 Advanced Electronics Laboratory I 2 Q.H.
(Prereq. 03.423)

The course covers experiments dealing with the use of oscilloscopes, the examination of transistor audio amplifiers, push-pull amplifiers, drivers, pulse and video amplifiers, transients and wave-shaping circuits, audio frequency oscillators, and the study of operational amplifiers.

03.428 Advanced Electronics Laboratory II 2 Q.H.
(Prereq. 03.427)

The course covers experiments dealing with the modulation of a class C amplifier, the diode detector, basic timing circuits, RF and crystal oscillators, astable multivibrators, logic gates, flip-flops, binary adders, registers and counters; active filters, frequency modulation detectors, and analog-to-digital and digital-to-analog conversion.

03.429 Advanced Electronics Laboratory III 2 Q.H.
(Prereq. 03.428)

Topics include spectral studies of FM and PM waves, amplitude limiters; the balanced modulators and single sideband generators; integrated circuit timers and monolithic random access memory; monolithic phase-locked loop as well as a series of microwave experiments and digital experiments.

03.430 Energy Conversion 4 Q.H.
(Prereq. 03.452 and 10.422)

Topics include generalized theory of rotating energy conversion devices; steady-state operation of the multiply excited direct-current machine; control of speed; special machines; transformers; steady-state considerations of induction and synchronous machines; generalized machine and circuit model; Laplace transform techniques applied to the analysis of dynamic operating modes of rotating machines.

03.437 Distributed Systems 4 Q.H.
(Prereq. 10.422 and 11.419)

Topics include radiation, transmission, and reception of electromagnetic waves; distributed-line constants and traveling waves of transmission lines; differential equations of the uniform line.

03.451 Circuit Analysis 4 Q.H.
(Prereq. 10.420 and 11.419)

Topics include Ohm's law, Kirchhoff's current and voltage laws, equivalent resistances and sources, mesh and modal analysis, network theorems, two-port networks and power relations—all with respect to direct currents; energy storage, singularity functions, response of R, L, and C elements to singularities.

03.452 Circuit Analysis II 4 Q.H.
(Prereq. 03.451)

Topics include complex algebra, phasors, frequency domain, mutual inductance, transformers, steady-state a-c theory, driving point and transfer impedances, power and energy in a-c circuits; Laplace transforms; partial fraction expansion; Laplace transform techniques applied to the solution of RLC networks.

03.453 Circuits Analysis III 4 Q.H.
(Prereq. 03.452)

The course covers application of differential equations to the solutions of linear, time-invariant electrical networks; introduction to singularity functions, convolution, and time-domain transient analysis; network topology and duality; introduction to the methods of transformation calculus and complex frequency concepts.

03.454 Circuits Analysis IV 4 Q.H.
(Prereq. 03.453)

Topics include signal analysis in the frequency domain; Fourier series; Fourier and Laplace transform methods; a varied selection of circuit

problems using Laplace transforms and related theorems.

03.460 Engineering Analysis I 4 Q.H.
(Prereq. 10.422, 03.452)

The course covers linear algebra and its application to circuit equations, solution of linear differential equations including an introduction to Laplace transforms.

03.462 Basic Power Systems I 4 Q.H.
(Prereq. 03.454)

Topics include consideration of power transmission lines; line constants; current voltage and power relations; introduction to electric power distribution loads, feeders, and substations; application of matrices.

03.463 Basic Power Systems II 4 Q.H.
(Prereq. 03.462)

Topics include consideration of symmetrical and unsymmetrical faults; protective devices—application and coordination; power flow in electric circuits; steady-state power limitations of systems; voltage regulation theory and application.

03.464 Basic Power Systems III 4 Q.H.
(Prereq. 03.463)

Topics include computer applications to power systems with emphasis on load-flow studies; basic ideas of systems planning, short-circuit studies, and system stability.

03.470 Digital Computers 4 Q.H.
(Prereq. 03.411)

Introduction to digital computer design. Topics include general computer organization, number systems and number representations, design characteristics of major computer units, Boolean algebra applications to computer design.

03.471 Digital Computers II 4 Q.H.
(Prereq. 03.470)

Examination of microprocessor architecture and organization. Study of the machine language and assembly coding of an industry-accepted microprocessor. A suitable topic from the current literature will be analyzed. Assembly language coding problems will be assigned.

03.477 Control Engineering I 4 Q.H.
(Prereq. 03.454 and 10.422)

Topics include analysis of linear servomechanisms under both transient and steady-state conditions; signal flow graphs; Laplace transforms used in the formulation of block diagrams and transfer function.

03.478 Control Engineering II 4 Q.H.
(Prereq. 03.477)

Topics include system stability; root locus techniques; treatment of Nyquist criteria and Bode diagram methods for systems evaluation.

03.490 Optical Instrumentation 4 Q.H.
(Prereq. 10.408 and 11.419)

The course focuses on telescopes, microscopes, etc., as optical system components. Includes magnification, aberrations, resolution criteria, photometry. Compatibility of system components and optimization of systems. The basic nonimage-forming systems used for analysis control and metrology.

03.498 Special Problems In Electrical Engineering Technology 2 Q.H.

(Prereq. Consent of Department Chairperson)
The course offers theoretical or experimental work under individual faculty supervision.

03.499 Special Problems in Electrical Engineering Technology 4 Q.H.

(Prereq. Consent of Department Chairperson)
The course offers theoretical or experimental work under individual faculty supervision.

Chemical Engineering Technology

04.481 Nuclear Technology 4 Q.H.*
(Prereq. 10.422 and 11.319)

Atomic and nuclear structure; discovery and nature of radioactivity. Nuclear reactions and energy, induced nuclear transformations, neutron properties, applications of radio nuclides. Radiological safety: nuclear instrumentation for particle detection, monitoring, and experimentation. The fission process and its applications; nuclear reactors—their classification, design, and application; nuclear fuel processing; radioactive waste disposal. Supplementary laboratory experiments.

06.400 Computer Programming for Engineering Technology 4 Q.H.

(Prereq. 10.408 or concurrently)
Introduction to the use of computers in the solution of problems using FORTRAN on interactive terminals. Students write and run programs to compute sequences, averages, etc. Other capabilities of the FORTRAN language, including DO loops, subscripted variables, alphanumeric manipulation, matrix algebra, and numerical methods.

* Lab fee required.

Graphic Science

09.108 Computer for Engineers

4 Q.H.

Introduction to use of computers in the solution of engineering problems; FORTRAN programming language. A survey of the organization and function of an elementary digital computer; the use of flowcharts in developing program logic; establishing and manipulating tables, arrays, and matrices in memory; using subprograms and subroutine packages; and graphical output on an X-Y plotter.

09.109 Engineering Graphics and Design

4 Q.H.

The orthographic system as a means of depicting three-dimensional objects and concepts on a two-dimensional medium. Progression from principal views to auxiliary views and sections. Reading and interpreting detail and assembly drawings and depiction by means of pictorial drawings and sketches. Fundamentals of manufacturing processes and dimensions and their interrelations. Elements of design and student involvement by evaluation of existing design, components, and systems. The student as the creative designer-engineer.

09.129 COBOL Programming for Computer Science Majors

4 Q.H.

A highly concentrated treatment of the fundamentals of the COBOL programming language, designed for Computer Science majors or others who have experience with other programming languages such as FORTRAN and BASIC. Topics include input/output and arithmetic operations, conditional statements, COBOL's PERFORM statements, structured programming, manipulation of tabular data, debugging techniques, and developing good programming.

09.130 Applied Programming

4 Q.H.

(Prereq. 06.100)

Elements of COBOL programming.

09.250 Programming and Algorithms

4 Q.H.

(Prereq. FORTRAN or COBOL)

Top-down modular and stepwise development and refinement of computer algorithms for problem solving. A well-structured language (PASCAL) will be used throughout the course, but emphasis is on developing algorithms rather than learning a programming language. Numeric and non-numeric algorithms are considered.

09.251 Compiler Construction

4 Q.H.

An examination of current compiler structures, including lexical and syntax analyses, grammars, symbol table generation, code generation, and optimization. In addition, language definition and notation, parsing algorithms, decision stacks, and related topics are presented to show how object code is generated in response to a higher-level language.

09.252 Analysis of Programming Languages

4 Q.H.

(Prereq. Two compiler languages, FORTRAN and COBOL)

Survey of significant features of existing programming languages, their data types and behavior at execution time. Structure of algorithmic languages, declarations, types of program constituents, local and non-local quantities, independent blocks, nested blocks, run-time push-down store. Overall structure of a PL-1 or ALGOL type compiler. Structured programming approach, basic constructs, top-down design. List processing and string manipulation languages; text editing activity.

09.253 Introduction to Artificial Intelligence

4 Q.H.

(Prereq. One year of high-level language, preferably LISP, although FORTRAN is acceptable)

The course is intended as an introduction to some of the processes involved in intelligent problem solving. The course will cover the major heuristic search methods used in automatic problem-solving theorem proving and game playing. A background in logic would be helpful, although not necessary; 26.151 is recommended.

09.254 Microcomputer Programming

4 Q.H.

(Prereq. 09.108 or FORTRAN programming language)

A first course in microprocessor computing covers hex codes for assembly language. Basics of architecture model, programming model, and addressing modes. Instruction set for typical machine. Programming techniques and details for a 6502 processor. Hands-on laboratory experimentation with typical interfacing problems. Case studies in the area of developing applications. Laboratory experimentation in staffed facility.

09.255 Microprocessor Applications

4 Q.H.

(Prereq. 09.254, assembly language, or permission of the instructor)

System architecture of several microcomputers, including microprocessors; bus design; multi-chip operation; and current trends in processors (8-, 16-, and 32-bit). Interfacing problems and hardware to include: sensors, actuators, D/A and A/D converters, data transmission, and parallel/serial I/O. Real-time programming with case studies. Network and distributed processing. Also included are development techniques and current state-of-the-art trends.

09.421 Principles of Computer Programming I

2 Q.H.

Rules for devising simple FORTRAN programs. Basic input/output techniques. FORMAT control. Algorithms for solving simple scientific

problems. Computing large sums; maxima and minima in both discrete and continuous cases.

09.422 Principles of Computer Programming II 2 Q.H.
(Prereq. 09.421)

Extended capabilities of the FORTRAN language. Manipulation of vectors and arrays. Subroutine and function subprogramming. Continued applications of computers, sorting, merging, root determination. A-Format.

09.423 Principles of Computer Programming III 2 Q.H.
(Prereq. 09.422)

Use of scientific subroutines, simulation, random numbers. Introduction to numerical methods (solving simultaneous equations, quadrature, derivatives). Use of plotter language. Display of information.

09.461 Engineering Design Graphics I 2 Q.H.
Introduction to engineering drawing. Orthographic projection and primary auxiliary views. Reading and interpreting multiview drawings. Isometric and oblique pictorial representation.

09.462 Engineering Design Graphics II 2 Q.H.
(Prereq. 09.461)

Emphasis on engineering drawings required to support engineering design, including standard conventions, dimensional, and basic production processes. Shop detail drawings are covered. Exercises in design processes are provided through selected projects and case studies.

09.463 Engineering Design Graphics III 2 Q.H.
(Prereq. 09.462)

Greater involvement in design by examining many commonly used components. Case studies of large systems discussed in class. Advanced design projects assigned.

09.464 Engineering Design Graphics IV 4 Q.H.
(Prereq. 09.463)

Graphical analysis of kinematic elements. Displacement, locus generators, velocity vectors, and sliding motion. Simple, compound, and reverted gear trains. Accelerations-analysis mechanisms such as cams and linkages. Functions and scales, nomographs. Introduction to self-connecting (feedback) systems.

Mathematics

10.100 Mathematics Preliminaries I 4 Q.H.
(Prereq. Permission of course coordinator)

The purpose of this course is to supply, together with 10.110, the high school math background necessary for a student to survive in 10.101, 10.104, or 10.118. Material includes the arithmetic of signed numbers, fractions, decimals, and percents; algebraic manipulation and solution of simple equations; elementary word problems; laws of exponents.

10.101 Basic Mathematics 4 Q.H.

The course examines systems of linear equations and their graphs. Graphing systems of linear inequalities in two variables with application to linear programming. Introduction to matrices, matrix multiplication, and vectors.

10.102 Basic Mathematics 4 Q.H.

Topics include introduction to probability, sample spaces with equiprobable events, permutations and combinations, conditional probability. Random variables, introduction to Markov processes.

10.104 Fundamentals of Mathematics 4 Q.H.

This course examines how to solve various kinds of algebraic equations: linear, quadratic, and linear systems in two and three unknowns. Applications to word problems such as motion, mixture, and variational problems. The concept of function, graphs, line slopes, and graphs of polynomials. Some elementary trigonometry and vectors in the plane.

10.105 Functions and Basic Calculus 4 Q.H.

The course provides an introduction to differential calculus. Elementary rules of differentiation with application to graph sketching and to maximum and minimum problems. Exponential and logarithmic functions with applications to problems in compound interest, population growth, and radioactive decay.

10.107 Calculus 4 Q.H.

The course offers a review and continuation of differential calculus, graphing and differentiation of trigonometric functions, introduction to integral calculus with applications to geometric problems and to differential equations.

10.108 Probability, Statistics, and the Computer 4 Q.H.
(Prereq. Nonmath majors)

The course presents a computer-oriented introduction to statistical methods, with applications in the social and life sciences. Topics include descriptive statistics, elementary probability, correlation and regression, and the fundamentals of statistical inference (confidence intervals and hypothesis testing) with a minimum of mathematical derivations. A statistical computer package such as MINITAB or SPSS is used in solving supplementary problems.

10.110 Mathematics Preliminaries II 4 Q.H.

The purpose of this course is to supply, together with 10.100, the high school math background

necessary for a student to survive in 10.101, 10.104, or 10.118. Topics include quadratic equations and systems of equations; graphing (including slope of a line and vertex of a parabola); more word problems; either logarithms, trigonometry, or some of both at the instructor's discretion; in winter and spring quarters the material covered in 10.100 will be assumed; in the fall quarter there is an overlap with 10.100 on solving equations, word problems, and laws of exponents.

10.118 College Mathematics for Business 4 Q.H.

Topics include sets, rectangular coordinates and graphs, functions and functional notation, linear and quadratic functions, exponential and logarithmic functions, systems of linear equations, summations, inequalities, permutations and combinations, elementary probability concepts, arithmetic and geometric progressions, simple and compound interest, annuities.

10.119 Fundamentals of Mathematics 4 Q.H.
(Prereq. 10.118 or equiv.)

Topics include matrices; Gaussian elimination; inverses of matrices; systems of linear inequalities; feasible regions; graphical solution of linear programming problems; limits; derivatives; differentiation of polynomials; differentiation of exponential and logarithmic functions; maxima, minima, and points of inflection; optimization in nonlinear problems; marginal analysis of cost revenue and profit functions.

10.120 Introduction to Computers I 4 Q.H.
(Prereq. Nomath majors)

This course has two goals: (1) to introduce computers and consider their applications, and (2) to introduce computer programming so that the uses and limitations of computers can be discussed intelligently. Small programs will be written and run. Applications such as sorting, searching, data processing, simulation, and artificial intelligence will be covered.

10.122 Numerical Methods with a Hand Calculator 4 Q.H.

Course covers the use of scientific hand calculator. Topics include the meaning and use of most of the keys, e^x , $\ln$, $\log$, and the trigonometric functions; RPN and algebraic notation; and a variety of computations that can be done easily on a scientific calculator—least squares, compound interest, solutions of equations, iteration techniques, difference equations, Euler's Method, difference quotients, and numerical integration. Techniques to promote speed and accuracy in using calculators for course work problems are emphasized. This course is intended for students who may take science courses.

10.126 Mainstreams of Mathematics 4 Q.H.

This course traces the development of

mathematical thought by focusing on some of its most exciting aspects. Individual projects supplement lectures and readings, enabling students with diverse backgrounds to rediscover mathematics. The level is nontechnical; no more than high school algebra and geometry is assumed. Topics vary from year to year, but may include mathematical games, a wide variety of puzzles, ancient number systems, logic and computers, calculus and the scientific revolution, art and symmetry. The course may be used to satisfy the math-science distribution requirement but not any major requirements.

10.130 Introduction to Computers and Computation 4 Q.H.

Course offers an introduction to problem solving with the use of computers. Students are expected to design, write, debug, and test programs in BASIC programming language. Course includes application of programming to a wide variety of problems, including statistical analysis of data, plotting, artificial intelligence, and text processing.

10.131 Introduction to Computer Science 4 Q.H.

This is a second course in programming, dealing with problem solving in the context of computing. Structured programming using PASCAL language. Correctness, clarity, and reliability of programs are stressed.

10.140 Mathematical Analysis IV-V 5 Q.H.
(Prereq. Freshman calculus or equiv.)

This course is designed to help prepare transfer students for numerical analysis and differential equations. Calculus of one and several variables. Linear algebra, vector-valued functions, multiple integration, infinite series, Taylor's theorem, and complex numbers.

10.144, 10.145 Calculus each 6 Q.H.

This course sequence is designed to assist students in overcoming deficiencies in pre-calculus mathematics without losing ground in the 10.150 sequence. The two quarters review high school algebra, introduce trigonometric functions, and cover the material in 10.150 and 10.151. The five meetings per week include lecture and homework review sessions. Students are placed in this course by request or on the basis of their College Board scores and the results of an orientation-week diagnostic test.

10.150 Calculus 4 Q.H.

This is a first course in calculus in one variable, primarily for engineering students. Functions, graphs, lines, limits, continuity, derivatives, chain rule, curve sketching, related rates, and maxima-minima problems are included.

10.151 Calculus 4 Q.H.

Continuation of 10.150. The integral in one variable with applications to areas, volumes, lengths, work, pressure, etc. Trigonometric, exponential, and logarithmic functions.

10.152 Calculus 4 Q.H.

Continuation of 10.151. Further techniques of integration, elementary differential equations, polar coordinates, and further applications are included.

10.153 Calculus 4 Q.H.
(Prereq. 10.152)

Topics include solid analytic geometry, vectors in 3-space, partial derivatives with applications, multiple integration.

10.154 Calculus 4 Q.H.
(Prereq. 10.153)

Topics include linear algebra, power series.

10.155 Mathematical Analysis 4 Q.H.
(Prereq. 10.154)

This course examines ordinary differential equations, with emphasis on methods of solution. Includes first-order equations, Laplace transform, second-order linear equations, and systems of first-order linear equations. (Intended primarily for engineering students.)

10.156 Mathematical Analysis 4 Q.H.
(Prereq. 10.155)

Topics include numerical methods for solving ordinary differential equations, Fourier series, and selected partial differential equations by separation of variables. (Intended primarily for engineering students.)

10.160 Calculus for Biology Majors I 4 Q.H.

This is a first course in calculus with applications to biology, ecology, and medicine. Differentiation, curve sketching, antidifferentiation, and exponential functions are included.

10.161 Calculus for Biology Majors II 4 Q.H.
(Prereq. 10.160)

Continuation of 10.160. Topics include exponential growth and decay; integration and area; rules for differentiation; and functions of several variables, with Lagrange multipliers, total differentials, and the method of least squares.

10.162 Calculus for Biology Majors III 4 Q.H.
(Prereq. 10.161)

Continuation of 10.161. Topics include the natural logarithm; trigonometric functions; techniques of integration, including numerical methods and differential equations, with separation of variables and qualitative methods.

10.170 Geometry 4 Q.H.

This course provides a careful look at classical Euclidean geometry, Hilbert's axioms for geometry, and models; geometries of Bolyai-Lobachevsky.

10.181 Calculus 5 Q.H.

This course is designed primarily for mathematics, physics, and chemistry majors. Syllabus for 10.181 through 10.183 includes derivatives and integrals of one-variable functions; applications to curve sketching, maxima

and minima problems, area, moments, simple volumes, etc.; approximation methods, including numerical integration, root finding, Taylor series, and power series. Students will also be required to master the use of the computer to make value tables and plot curves and to implement simple numerical algorithms.

10.182 Calculus II 5 Q.H.
(Prereq. 10.181) Continuation of 10.181.**10.183 Calculus III 5 Q.H.**
(Prereq. 10.182) Continuation of 10.182.**10.181 (H) Calculus for Honors Science Majors 4 Q.H.**

An equivalent to 10.181, this course is designed to expose the student to a broader range of mathematical concepts while also presenting the basic calculus material that students learn in the nonhonors sections of 10.181. The course is especially intended for freshman honors science majors.

10.182, 10.183 Calculus for Honors Science Majors each 4 Q.H.
Continuation of 10.181 for winter and spring terms.**10.184 Calculus and Linear Methods I 4 Q.H.**
(Prereq. 10.183)

The course focuses on methods of calculus and vector analysis to study curves, surfaces, and functions of several variables. Topics include parameterization of lines and planes, tangents and normal vectors, partial derivatives, maxima and minima problems, linear approximations, and tangent planes. Some linear algebra.

10.185 Calculus and Linear Methods II 4 Q.H.
(Prereq. 10.184)

Continuation of 10.184. Topics include multiple integration, line integrals, and exact differentials; various forms of Stoke's theorem; more linear algebra.

10.186 Differential Equations and Linear Methods I 4 Q.H.

The course focuses on ordinary differential equations and linear algebra. First-order equations, higher- (primarily second-) order linear differential equations, systems of linear differential equations. Linear algebra includes eigenvalues and eigenvectors, primarily for two-dimensional systems. Applications of ordinary differential equations.

10.187 Differential Equations and Linear Methods II 4 Q.H.
(Prereq. 10.186)

Topics include analysis of linear partial differential equations (wave equations, heat equation, and potential equation). Ordinary differential equations with boundary values. Fourier analysis, orthogonal functions. Also, numerical methods and other topics in ordinary differential equations.

10.206 Introduction to Analysis of Algorithms

(Prereq. 10.186)

4 Q.H.

The course offers theoretical study of algorithm design, evaluation of algorithms, and other algorithmic concepts and techniques useful for computer programming. Topics include graph and matrix algorithms, testing primeness, factoring; evaluating greatest common divisors, linear Diophantine equations; evaluating square roots, logarithms, exponentials, etc.; truncation and round-off errors; random number generation; information organizational and retrieval; sorting.

10.208 Probability I**4 Q.H.**

(Prereq. 10.154 or 10.185)

Topics include probability functions for finite and infinite spaces; conditional probability and independence; discrete and continuous probability distributions for one or more random variables; expectation; moments; binomial, Poisson, and normal distributions; central limit theorem.

10.209 Probability II**4 Q.H.**

(Prereq. 10.208)

Selected topics are studied, including introduction to stochastic processes, with emphasis on Poisson processes and Markov chains.

10.210 Introduction to Discrete Structures 4 Q.H.

Elementary concepts of combinatorial mathematics. Graph theory, enumeration algorithms, permutation groups, and coding theory. Application of these structures to various areas of computer science.

10.220 Mathematical Statistics**4 Q.H.**

(Prereq. 10.208)

Topics include estimation of parameters, confidence intervals, hypothesis testing, regression, sampling distributions. Introduction to analysis of variance and statistical decision theory.

10.221 Applied Analysis**4 Q.H.**

(Prereq. 10.187)

Selected topics are chosen to demonstrate the application of mathematics to interesting physical and biological problems. Methods chosen from ordinary and partial differential equations, calculus of variations, Laplace transforms, singular perturbations, special functions, dimensional analysis, and other techniques of applied mathematics.

10.222 Applied Analysis**4 Q.H.**

(Prereq. 10.221)

Continuation of 10.221

10.223 Numerical Analysis**4 Q.H.**

(Prereq. Two years of calculus and one course in programming)

This is a computer-oriented introductory course with emphasis on appreciation of the difference between the theoretical existence of a solution and its numerical calculation. Topics covered:

systems of linear equations, nonlinear equations, interpolation, and approximation of functions. Students are required to program and analyze problems on a computer.

10.224 Numerical Analysis**4 Q.H.**

(Prereq. 10.223)

Continuation of 10.223. Topics include numerical differentiation and integration, solution of ordinary differential equations, and other topics as time permits.

10.226 Functions of a Complex Variable I 4 Q.H.

(Prereq. 10.184 or equiv.)

Topics include algebra and geometry of complex numbers; concepts of limit, continuity, and derivative in the complex domain; holomorphic functions, series, contour integration. Applications.

10.227 Functions of a Complex Variable II 4 Q.H.

(Prereq. 10.226)

Continuation of 10.226. Further topics may include conformal mapping, analytic continuation, Riemann surfaces, the Laplace transform and inverse transform, elliptic functions, applications.

10.230 Linear Programming**4 Q.H.**

(Prereq. Nonmath majors; one year of college mathematics)

Introduction to concepts and techniques of linear programming, game theory, stochastic processes. Application to economics, social sciences, and other related fields.

10.232 Multivariate Statistics**4 Q.H.**

(Prereq. 10.220)

The course examines methods of classification, estimation, and prediction based on several statistical variables.

10.235 Automata Theory and Formal Languages

(Prereq. 10.214 and 10.215 or equiv.)

4 Q.H.

Topics include finite-state machines and regular expressions, context-free grammars. Parsing of context-free languages. Context-sensitive grammars, push-down stores, stack machines and linear-bounded automata. Turing machines, undecidability, description of computation using list structures, program machines, and programs.

10.236 Artificial Intelligence**4 Q.H.**

(Prereq. 10.215 or 05.202)

The course provides analysis of current computer programs dealing with problems such as theorem proving, chess playing, general problem solvers, robotics, symbolic computation, preceptrons, self-reproducing automata, and parallel machines.

10.240 Mathematical Models in the Life Sciences

(Prereq. One year of calculus)

4 Q.H.

The focus of this course is the derivation and solution of mathematical models in biology, psychology, and the social sciences. Topics may include population dynamics, diffusion

processes, pollution control systems, neural networks, and mathematical genetics.

10.246 Linear Algebra I **4 Q.H.**

(Prereq. 10.187 or permission of instructor)

Topics include vectors and vector spaces, including function spaces, subspaces. Lengths, angles, scalar products; volumes, determinants. Linear independence and dependence, dimension, linear and affine maps, kernel and image. Algorithms: row operations, double triangular form, inversion. Introduction to linear maps. In particular, characteristic polynomials, eigenvalues, and eigenvectors in low dimensions.

Note: Students who have not completed 10.181-10.187 should inform the course instructor of their backgrounds.

10.247 Linear Algebra II **4 Q.H.**

(Prereq. 10.246)

The course focuses on detailed study of linear maps. Part I: Symmetric maps and quadratic forms. Isometries and skew-symmetric maps. Decomposition of general linear maps using symmetric maps and isometries. Part II: Polynomials evaluated on linear maps. Generalized eigenspaces. Jordan form. As time permits, an introduction to computational methods with emphasis both on geometry underlying algorithms and on practical advantages and limitations. A survey of related areas in mathematics in which linear ideas play a role is included.

Note: Upper-level students who have not completed the 10.181-10.187 program may take 10.246-10.247. Such students should inform the course instructor regarding their particular backgrounds.

10.250 Analysis I **4 Q.H.**

(Prereq. 10.187 or permission of instructor)

The course examines the theoretical foundations of calculus: limits, measure, continuity and related concepts. Analysis I and II are intended to serve as a bridge between the 10.181-10.187 calculus sequence and the more advanced analysis courses, such as 10.221-2, 10.226, and 10.264-5.

10.251 Analysis II **4 Q.H.**

(Prereq. 10.250)

Continuation of 10.250. The course focuses on calculus, applying the concepts introduced in Analysis I.

10.254 Introduction to Groups and Their Applications **4 Q.H.**

Topics include examples of groups (symmetry groups, permutation groups, matrix groups, cyclic groups) and their subgroups. Finite groups and orders of subgroups. Homomorphisms and normal subgroups. Applications to some of the following, depending on time and interest: geometry, number theory, crystallography, physics, and combinatorics.

10.256 Topics In Rings, Fields, and Number Theory **4 Q.H.**

Topics include algebraic properties of the integers and rational, real, and complex numbers. Commutative rings, ideals, integral domains, and other quotient fields. Polynomial rings. Quadratic extension fields. Gaussian integers. Other topics as time permits.

10.257 Optimization and Mathematical Game Theory **4 Q.H.**

(Prereq. Some linear algebra, e.g., 10.246; or permission of instructor.)

Topics include convex sets in Euclidean n -space, linear and nonlinear programming, zero-sum games, dynamic programming. Students are encouraged to program selected solution methods for a computer.

10.264 Recent Ideas in Geometry **4 Q.H.**

(Prereq. 10.251 and 10.247, or permission of instructor)

Topics chosen by the instructor may vary each year. Topological classification of surfaces, theory of critical points and singularities of mappings, topological study of vector fields, knot theory, graph theory, differential geometry of surfaces, algebraic curves, homotopy.

10.265 Recent Ideas In Geometry **4 Q.H.**

(Prereq. 10.264) Continuation of 10.264.

10.271 Foundations of Mathematics **4 Q.H.**

Topics include development, structure, and use of the number systems; peano postulates for integers; construction of negative numbers and rationals; development of real and complex numbers; introduction to model theory and the existence and use of alternative number structures; hyperintegers; calculus with infinitesimals.

10.272 Foundations of Mathematics **4 Q.H.**

Course material includes set theory; rules for set formation; the axiom of choice and its role in mathematics; transfinite cardinal and ordinal numbers and their arithmetic; axiomatizations of set theory.

10.273 History of Mathematics **4 Q.H.**

Topics include development of the various branches of mathematics; lives of outstanding mathematicians; growth of mathematical knowledge and its relation to culture.

10.274 Number Theory **4 Q.H.**

(Prereq. 10.246 or permission of instructor)

An introduction to the elementary methods of analytic number theory, this course focuses on divisibility, congruences, arithmetical and multiplicative functions, quadratic reciprocity, and equivalent formulations of the prime number theorem.

10.281-10.289 Directed Study **4 Q.H.**

(Prereq. Permission of instructor)

Programs of directed study, held one or more quarters, are available for highly motivated

students who wish to explore mathematical situations and theories in depth. Directed study can be used as an opportunity to examine familiar material in fresh ways or to explore new material that is not offered in formal courses. It is hoped that directed study programs will provide students strong in mathematics and the related sciences a chance to develop the art and skill needed to work independently and creatively in mathematics.

Note: Students strong in mathematics are permitted to enroll in graduate courses in mathematics.

10.295, 10.296, 10.297, 10.298 Honors Program (each) 4 Q.H.

For prerequisites and other details, see the section on the Junior-Senior Honors Program on page 5.

10.407 College Algebra and Trigonometry I 4 Q.H.

Topics include fundamental algebraic operations, complex numbers, radicals, and exponents, functions, linear and quadratic equations, irrational equations, inequalities, variation, roots and polynomial equations.

10.408 College Algebra and Trigonometry II (Prereq. 10.407) 4 Q.H.

Topics include logarithms; trigonometric functions of angles in degrees and radians, trigonometric identities and equations, right triangles, oblique triangles, complex numbers in trigonometric form, systems of equations, determinants.

10.420 Calculus I 4 Q.H.
(Prereq. 10.408)

Plane analytic geometry; differentiation of algebraic functions; rate, motion, maximum and minimum problems; derivatives of higher order; curve sketching; basics in functions, limits, and continuity.

10.421 Calculus A 4 Q.H.
(Prereq. 10.420)

Topics include applications of derivatives to curve sketching; antidifferentiation; the definite integral, with applications; calculus of non-algebraic functions—logarithmic, exponential, and trigonometric; calculus of inverse trigonometric functions; techniques of integration; indeterminate forms; L'Hospital's rule.

10.422 Calculus B 4 Q.H.
(Prereq. 10.420)

Topics include polar coordinates, vectors in a plane, calculus of functions of several variables, partial differentiation, multiple integrals, infinite series, vector analysis, introduction to differential equations.

10.423 Differential Equations 4 Q.H.
(Prereq. 10.422)

Topics include ordinary differential equations—standard types of the first order, linear differential equations, especially with constant coefficients; Laplace transforms; series solutions of differential equations; Fourier series and orthogonal functions.

Physics

Courses are listed according to level and degree of specialization and are not in numerical order. General interest courses have no prerequisites and may be used to satisfy College of Arts and Sciences distribution requirements in science. Introductory physics courses are basic first-year physics lecture courses; the corresponding laboratories are listed under introductory physics laboratories. Advanced physics and astronomy courses require one year of introductory physics and may be used to satisfy degree requirements for physics majors. Courses marked with an asterisk * are offered for students in the Lincoln College full-time program; they do not fulfill credit requirements in the College of Arts and Sciences.

General Interest Courses

11.109 Physics in Music 4 Q.H.

This course discusses the physical principles involved in producing, recording, and reproducing music. Topics include explanations of the operation of various instruments in terms of the basic properties of resonances and waves; physical and psychological response of the ear; the physical basis of the modern (well-tempered) system of tuning; the operation of microphones, amplifiers, loudspeakers, tape recorders, radios, and other devices.

11.180 Introduction to Astronomy I 4 Q.H.

The first quarter of a two-quarter sequence, this course offers the nonscience student an in-

troduction to modern astronomical ideas. Topics include introduction to the cosmos; tools of the astronomer (atoms, the nature of light and radiation, telescopes, space astronomy); the earth in space; our solar system (origin and future of the solar system, the planets and other bodies, the latest from spacecraft flights, the sun as our bridge to the stars); the question of life in the universe.

11.181 Introduction to Astronomy II 4 Q.H.
(Prereq. 11.180)

Topics include properties of stars: life and death of stars (Hertzsprung Russell Diagram, birth of stars, main sequence, red giants, white dwarfs,

supernovae, neutron stars, black holes); our Milky Way galaxy; galaxies; quasars, cosmology (the expanding universe, the big bang, the future of the universe).

93.171 Introduction to Science I 4 Q.H.
93.171 and 93.172 form a two-quarter sequence for nonscience majors that provides an interdisciplinary treatment of the basic ideas of the natural sciences. Concepts such as energy, gravity, and the atom are discussed, followed by a consideration of the ways in which atoms combine to form the substances that comprise matter.

93.172 Introduction to Science II 4 Q.H.
(Prereq. 93.171)

A continuation of 93.171, this part of the course discusses life, its origin from inanimate surroundings, cells, and some of the cellular processes important to living things.

Introductory Physics Courses

11.117 Physics for Science Majors I 4 Q.H.
(Prereq. 10.181 or equiv. may be taken concurrently)

Topics include mechanics: kinematics, Newton's laws, circular motion, work energy, linear momentum. To take the laboratory for this course, register for 11.147 concurrently.

11.118 Physics for Science Majors II 4 Q.H.
(Prereq. 11.117; 10.182 or equiv. may be taken concurrently)

Topics include rotational motion, angular momentum, harmonic motion, wave motion, sound, heat and thermodynamics, kinetic theory. To take the laboratory for this course, register for 11.148 concurrently.

11.119 Physics for Science Majors III 4 Q.H.
(Prereq. 11.117; 10.183 or equiv. may be taken concurrently)

Topics include electricity and magnetism; circuits; electromagnetic waves; topics in modern physics. To take the laboratory for this course, register for 11.149 concurrently.

11.126 Physics Review for Engineering Students 6 Q.H.
(Prereq. One year of college physics; knowledge of elementary calculus)

This course offers an intensive review for students who have had previous college physics courses not equivalent to the engineering sequence 11.203-11.206. Topics include fundamentals of mechanics, electricity, and magnetism with emphasis on the use of vectors and elementary calculus. Passing this course is equivalent to passing 11.205 and 11.206.

11.136 Basic Physics I 4 Q.H.
Topics include the physical properties of gases and condensed matter, force and pressure, hydrostatics, ideal and real gases, condensation and evaporation, surface tension, osmosis and

fluid flow. Laboratory is an integral part of the course.

11.137 Basic Physics II 4 Q.H.
(Prereq. 11.136)

A continuation of 11.136, this course focuses on electric circuits and current flow, a-c circuits and measurements with the oscilloscope, atomic structure and spectroscopy, spectrophotometry, nuclear physics.

11.171 Physics for the Life Sciences I 4 Q.H.
Topics include vector addition of force, principles of statics; Newton's second law, kinetic and potential energy; pressure static properties of fluids, fluid flow. To take the laboratory for this course, register for 11.173 concurrently.

11.172 Physics for the Life Sciences II 4 Q.H.
(Prereq. 11.171)

Topics include wave motion, sound, light, optics, static electricity, d.c. circuits, magnetism. To take the laboratory for this course, register for 11.174 concurrently.

11.175 Physics for the Life Sciences III 4 Q.H.
(Prereq. 11.171)

Topics include temperature, gas laws, properties of liquids (surface tension and osmotic pressure), properties of solids, thermal physics, Coulomb's law, atomic and nuclear physics.

11.203 Physics for Engineering Students I 4 Q.H.
(Prereq. 10.150 or equiv. may be taken concurrently)

The first quarter of a four-quarter sequence intended primarily for engineering students, this course covers mechanics, kinematics, dynamics, Newton's laws, work, energy, linear momentum, collisions.

11.204 Physics for Engineering Students II 4 Q.H.
(Prereq. 11.203; 10.151 or equiv. may be taken concurrently)

A continuation of 11.203, this course focuses on rotational dynamics, angular momentum, statics, harmonic motion, wave motion, sound, heat, and the First Law of Thermodynamics.

11.205 Physics for Engineering Students III 4 Q.H.
(Prereq. 11.204; 10.152 or equiv. may be taken concurrently)

A continuation of 11.204, the focus of this course is on electricity, electrostatics, Gauss's law, electric fields, potential, capacitance, resistance, current Ohm's law, circuits, the magnetic field.

11.206 Physics for Engineering Students IV 4 Q.H.
(Prereq. 11.205; 10.153 or equiv. may be taken concurrently)

A continuation of 11.205, this course covers magnetism: Ampere's law, induction, inductance, magnetic energy; electromagnetic oscillations, electromagnetic waves, polarization; ray optics: reflection, refraction, mirrors and lenses; wave optics: interference, diffraction, gratings.

- 11.417 Physics I*** **4 Q.H.**
(Prereq. 10.407, may be taken concurrently)
Topics Include kinematics and dynamics of particle motion, Newton's laws, projectile and circular motion, conservation laws for momentum and energy, rotational motion, simple harmonic motion.
- 11.418 Physics II*** **4 Q.H.**
(Prereq. 11.417; 10.408, may be taken concurrently)
Topics include wave motion, intensity, interference phenomena, Doppler effect, vibrating systems, temperature, heat, change of state, heat transfer, kinetic theory of gases, general gas laws, thermodynamics.
- 11.419 Physics III*** **4 Q.H.**
(Prereq. 11.418)
Topics include electrostatics, magnetism, magnetic induction, induced currents, direct- and alternating-current circuits, properties of light, reflection, refraction, dispersion, optical systems, diffraction, polarization.
- 11.420 Physics IV*** **4 Q.H.**
(Prereq. 11.419)
Course focuses on static electric and magnetic fields; experimental basis for Maxwell's equations; electromagnetic waves.

Introductory Physics Laboratories

- 11.110 Physics Laboratory for Engineering Students I** **1 Q.H.**
(Prereq. 11.205)
This course is the first of a two-quarter laboratory sequence in which the student performs experiments from various fields of physics.
- 11.111 Physics Laboratory for Engineering Students II** **1 Q.H.**
(Prereq. 11.110 and 11.206)
This course is a continuation of 11.110
- 11.147 Physics Laboratory for Science Majors I** **1 Q.H.**
(Prereq. 11.117 concurrently)
Focus is on laboratory experiments related to topics covered in 11.117.
- 11.148 Physics Laboratory for Science Majors II** **1 Q.H.**
(Prereq. 11.147; 11.118 concurrently)
Focus is on laboratory experiments related to topics covered in 11.118.
- 11.149 Physics Laboratory for Science Majors III** **1 Q.H.**
(Prereq. 11.147; 11.119 concurrently)
Focus is on laboratory experiments related to topics covered in 11.119.

*See introduction to this section.

- 11.173 Physics Laboratory for the Life Sciences I** **1 Q.H.**
(Prereq. 11.171 concurrently)
This course is the first quarter of a two-quarter laboratory sequence accompanying 11.171 and 11.172.
- 11.174 Physics Laboratory for the Life Sciences II** **1 Q.H.**
(Prereq. 11.173; 11.172 or 11.175 concurrently)
This course is a continuation of 11.173.
- 11.473 Physics Laboratory I*** **2 Q.H.**
(Prereq. 11.417; 11.418 concurrently)
This course covers experiments from various physics topics that have been covered in 11.417 and, concurrently, in 11.418.
- 11.474 Physics Laboratory II*** **2 Q.H.**
(Prereq. 11.473, 11.418; 11.419 concurrently)
This course is a continuation of 11.473, with experiments from topics in 11.418 and 11.419.

Advanced Physics and Astronomy Courses

- 11.127 Intermediate Mechanics** **4 Q.H.**
(Prereq. 11.118 and 11.119; 10.184 concurrently)
Topics include classical mechanics in two and three dimensions; a review of Newton's laws; special emphasis on conservation theorems for energy, momentum and angular momentum; harmonic and wave motion.
- 11.128 Electric and Magnetic Fields** **4 Q.H.**
(Prereq. 11.127; 10.185 concurrently)
This course focuses on the basic concepts of electric and magnetic fields, including electric and magnetic fields in free space and materials; Maxwell's equations in integral form.
- 11.182 Introduction to Astrophysics and Cosmology** **4 Q.H.**
(Prereq. Three quarters of elementary physics)
The purpose of this course is to introduce the student to current ideas in astrophysics and cosmology, with emphasis on recent advances in this field. Topics include tools of the astronomer (gamma- X-, UV-, optical-, infrared-, radio-telescopes, spectroscopes, spacecrafts, etc.); solar system; stellar properties (site luminosity); stellar spectra; Hertzsprung-Russell diagram; stellar energy sources (gravitational, nuclear); evolution of stars (birth, main sequence, red giants, white dwarfs, planetary nebulae, supernovae, neutron stars and pulsars, black holes and gravitational collapse); methods of interstellar and intergalactic distance measurement; our Milky Way galaxy; extragalactic objects (galaxies, clusters of galaxies, radio galaxies, quasars); cosmology (Olber's paradox; recession of galaxies, big bang theory,

cosmic background radiation, formation of galaxies, the future of the universe).

11.200 Classical Mechanics 4 Q.H.
(Prereq. 11.127 and 10.186)

This course covers advanced topics in classical mechanics, including vector kinematics; harmonic oscillator and resonance; generalized coordinates; Lagrange's equations; central forces and the Kepler problem; rigid body motion.

11.208 Mathematical Physics 4 Q.H.
(Prereq. 11.119 and 10.185; 10.187 concurrently)

Topics include review of linear algebra and vector calculus; special functions and partial differential equations of physics; potential theory; functions of a complex variable.

11.21A (B, C, etc.) Independent Study 1 Q.H.

11.22A (B, C, etc.) Independent Study 2 Q.H.

11.23A (B, C, etc.) Independent Study 3 Q.H.

11.24A (B, C, etc.) Independent Study 4 Q.H.

11.211 Electricity and Magnetism I 4 Q.H.
(Prereq. 11.128; 11.208 or equiv.)

The first of a two-quarter sequence in electromagnetic theory, this course covers Maxwell's equations and their experimental basis; electrostatics and magnetostatics; the electromagnetic field in empty space; electromagnetic waves.

11.212 Electricity and Magnetism II 4 Q.H.
(Prereq. 11.211 or equiv.)

A continuation of 11.211, this course focuses on energy and momentum in the electromagnetic field; electrodynamics; the interaction of matter and the field; radiation.

11.220 Thermodynamics and Kinetic Theory 4 Q.H.
(Prereq. 11.119 or 11.206; 10.185)

Topics include First and Second Laws of Thermodynamics; entropy and equilibrium; thermodynamic potentials; elementary kinetic theory; statistical mechanics and the statistical interpretation of entropy.

11.221 Wave Motion and Optics 4 Q.H.
(Prereq. 11.128)

Topics include harmonic and coupled oscillators, wave equation; geometrical and physical optics; interference, diffraction, optics of solids, amplification of light; lasers.

11.230 Modern Physics 4 Q.H.
(Prereq. 11.119, 11.206, or equiv.)

The course provides a review of experiments demonstrating the atomic nature of matter, the properties of the electron, the nuclear atom, the wave-particle duality, spin, and the properties of elementary particles. The course discusses, mostly on a phenomenological level, such subjects as atomic and nuclear structure, properties of the solid state, and elementary particles.

11.231 Physics Review for Re-entry Students 4 Q.H.
(Prereq. Two years of physics)

This is a review course on the material covered by 11.200, 11.220, and 11.221. Topics include vector kinematics; generalized coordinates; Lagrange equations; harmonic and coupled oscillators, wave equation; physical optics, interference, diffraction, optics of solids, lasers; entropy and equilibrium, thermodynamic potentials; elementary kinetic theory; statistical mechanics.

11.240 Quantum Mechanics I 4 Q.H.
(Prereq. 11.230 or 12.170; 11.208 or equiv.)

The first of a two-quarter sequence in quantum mechanics, this course focuses on observations of macroscopic and microscopic bodies, the uncertainty principle, wave-particle duality, probability amplitudes, Schrodinger wave theory, one-dimensional problems.

11.241 Quantum Mechanics II 4 Q.H.
(Prereq. 11.240)

A continuation of 11.240, this course covers discrete and continuous states, Schrodinger equation in three dimensions, angular momentum, general theory of quantum mechanics, applications.

11.246 Electronics for Scientists I 4 Q.H.

11.246 and 11.247 form a two-quarter sequence covering electronic techniques for experimental research in many different fields of science. Topics include principles of semiconductor devices; analog techniques (amplification, feedback, integration); digital techniques (counting, multiplexing, logic); design of electronic subsystems (analog-to-digital converters, phase-sensitive detectors, data-logging systems); understanding specifications of commercial electronic equipment. Lab examples make use of up-to-date integrated and discrete devices such as are currently used in the electronic industry.

11.247 Electronics for Scientists II 4 Q.H.
(Prereq. 11.246)

This course is a continuation of 11.246.

11.260 Wave Laboratory 4 Q.H.
(Prereq. 11.128 or 11.206)

This course offers a general treatment of the problems of mechanical and electromagnetic radiation as wave phenomena. Topics include the differential wave equation and its application to selected topics; interference and diffraction theory from the standpoint of the Huygens-Fresnel and Kirchhoff formulations; selected experiments in acoustics, optics, and microwaves to illustrate these problems.

11.272 Modern Physics Laboratory 4 Q.H.
(Prereq. 11.230 or permission of instructor)

This course presents experiments investigating

the atomic nature of matter, the properties of the electron, and special relativity. The work involves vacuum-system techniques and machine-shop practice.

11.273 Advanced Physics Laboratory 4 Q.H.
(Prereq. 11.246 and 11.247)

This course presents special projects in modern experimental physics; including electronic instrumentation used in measuring physical quantities and use of microprocessors.

11.282 Introduction to Solid State Physics 4 Q.H.
(Prereq. 11.230 or 12.170; 11.220 or equiv.)

This course offers a semi-classical treatment of the thermal, magnetic, and electrical properties of crystalline solids. Topics include X-ray diffraction and the reciprocal lattice, elasticity and lattice vibrations, specific heat, properties of insulators, magnetism in insulators and metals, introduction to the band theory of metals.

11.285 Introduction to Nuclear Physics 4 Q.H.
(Prereq. 11.230)

Topics include nuclear structure, nuclear masses, radioactivity, nuclear radiation, interaction of radiation and matter, detectors, fission, nuclear forces, elementary particles.

11.295, 11.296, 11.298 Junior-Senior Honors Program (each) 4 Q.H.

For prerequisites and other details, see the section on the Junior-Senior Honors Project on page 5.

11.417 Physics I (Mechanics) 4 Q.H.
(Prereq. 10.407, may be taken concurrently)
Kinematics and dynamics of particle motion, Newton's laws, projectile and circular motion, conservation laws for momentum and energy, rational motion, simple harmonic motion.

11.418 Physics II 4 Q.H.
(Prereq. 11.417; 10.408 may be taken concurrently)
Wave motion, intensity, interference phenomena, Doppler effect, vibrating systems, temperature, heat, change of state, heat transfer, kinetic theory of gases, general gas laws, thermodynamics.

11.419 Physics III (Electricity Magnetism) 4 Q.H.
(Prereq. 11.418)

Electrostatics, circuit elements, direct-current circuits, magnetism, electromechanical devices, alternating-current circuits, electronics, electromagnetic waves.

11.473 Physics Laboratory I 2 Q.H.
(Prereq. 11.417; 11.418 concurrently)

Experiments from various physics topics that have been covered in 11.417 and, concurrently, in 11.418.

11.474 Physics Laboratory II 2 Q.H.
(Prereq. 11.473, 11.418; 11.419 concurrently)

A continuation of 11.473, with experiments from topics in 11.418 and 11.419.

Chemistry

12.106 General Chemistry 5 Q.H.*

This course, designed for nonchemistry majors, focuses on basic concepts and definitions: the mole concept and chemical stoichiometry, states of matter, solutions, periodicity of elements, atomic structure, chemical bonding and reactions.

12.107 General Chemistry 5 Q.H.*
(Prereq. 12.106)

This course, for students who *will not* be taking further chemistry, covers chemical equilibria; acids, bases, and buffers; an introduction to organic and biochemistry; elementary thermodynamics; voltaic cells; and nuclear chemistry.

12.111 General Chemistry 4 Q.H.*

The course examines basic principles of inorganic and organic chemistry and how they relate to human body processes.

12.112 General Chemistry 4 Q.H.*
(Prereq. 12.101)

The course focuses on biochemistry principles.

12.114 General Chemistry 4 Q.H.

Primarily for engineering students. Introduction to the principles of chemistry, focusing upon the states and structure of matter and chemical stoichiometry.

12.115 General Chemistry 4 Q.H.
(Prereq. 12.114)

Primarily for engineering students, the course offers an introduction to the principles of chemistry, focusing upon chemical equilibria, the nature of some common materials, and energy considerations in chemical and nuclear transformations.

12.118 General Chemistry Laboratory 1 Q.H.*

Optional laboratory for 12.115, General Chemistry, for engineering students. Experiments pertaining to lecture material.

12.119 General Chemistry 5 Q.H.*
(Prereq. 12.106)

For nonchemistry majors who *will* be taking 12.144, Organic Chemistry. Subjects covered include chemical kinetics and equilibria; acids and

*Lab fee required.

bases; elementary thermodynamics and kinetics; electrolysis and electrochemistry; chemistry of the representative elements; and nuclear chemistry.

12.124 General Chemistry 4 Q.H.

Similar to 12.127, but without laboratory. (Not available to majors from chemistry, biology, or pharmacy/allied health sciences.)

12.125 General Chemistry 4 Q.H.

(Prereq. 12.124)

Similar to 12.128, but without laboratory. (Not available to majors from chemistry, biology, or pharmacy/allied health sciences.)

12.127 General Chemistry 5 Q.H.*

For chemistry majors and selected students in other majors, such as biology, physics, etc. Course focuses on basic concepts and definitions, moles, gas laws, stoichiometry, atomic structure, periodic properties, chemical bonding.

12.128 General Chemistry 5 Q.H.*

(Prereq. 12.127 or 12.124)

Topics include solutions, chemical kinetics, chemical equilibrium, chemical thermodynamics, electrochemistry, chemistry of the representative elements.

12.129 The Chemical Elements 5 Q.H.*

(Prereq. 12.115, 12.119, 12.128, or equiv.)

For chemistry majors and selected students in other majors. The principal concepts of chemistry (thermodynamics, chemical bonding, kinetics) are applied to a systematic survey of the characteristic behavior of the chemical elements and their compounds.

12.134 Composition of the Oceans 4 Q.H.

Seawater, its nonliving components, and the changes they undergo during natural and technological activities. Principles illustrated include the structures of substances and solutions, dynamic equilibrium, nuclear and ionic reactions, and the dynamics of pollution, as they relate to the oceans. The course presupposes an exposure to chemistry in secondary school. The course is not recommended for students who have completed a college-level chemistry course and is not for students majoring in any science.

12.144 Organic Chemistry 5 Q.H.*

(Prereq. 12.119, 12.128, or equiv.)

For nonchemistry majors. Course covers nomenclature, preparation, properties, and reactions of common organic compounds.

12.145 Organic Chemistry 5 Q.H.*

(Prereq. 12.144)

Continuation of 12.144.

12.147 Organic Chemistry 4 Q.H.*

(Prereq. 12.115)

For chemical engineering majors. Topics include

compounds: preparation, properties, and reactions of the more common classes of open-chain compounds; electronic interpretation of structures and reactions; petrochemicals; synthetic resins; carbohydrates; fats; and proteins.

12.148 Organic Chemistry 4 Q.H.*

(Prereq. 12.147)

Topics include aromatic compounds: preparation, properties, and reactions of the more common classes of aromatic compounds; electronic interpretation of structures and reactions of aromatic compounds; dyes, commercial solvents, and important industrial products. A brief introduction to alicyclic and heterocyclic compounds.

12.153 Organic Chemistry 3 Q.H.

(Prereq. 12.129)

For chemistry majors and selected students in other majors. Course covers synthesis and properties of aliphatic and aromatic hydrocarbons and their functional derivatives; correlation between the structure of organic compounds and their physical and chemical properties; and electronic interpretation of organic reactions.

12.154 Organic Chemistry 5 Q.H.*

(Prereq. 12.153)

Continuation of 12.153.

12.155 Organic Chemistry 5 Q.H.*

(Prereq. 12.154)

Continuation of 12.154.

12.161 Physical Chemistry 4 Q.H.*

(Prereq. 10.153 or 10.184, 11.119 or 11.205, or equiv.)

Chemical thermodynamics.

12.162 Physical Chemistry 4 Q.H.*

(Prereq. 12.161)

Topics include phase equilibria, solutions, kinetic theory of gases, chemical kinetics.

12.166 Physical Chemistry 3 Q.H.

(Prereq. 10.153 or 10.184, 11.119 or 11.205, or equiv.)

Similar to 12.161, but without laboratory.

12.168 Physical Chemistry 4 Q.H.*

(Prereq. 12.162 or 12.169)

Course covers quantum chemistry, particles and waves, Schrodinger wave mechanics, the chemical bond.

12.169 Physical Chemistry 3 Q.H.

(Prereq. 12.161 or 12.166)

Similar to 12.162, but without laboratory.

12.170 Physical Chemistry 3 Q.H.

(Prereq. 12.162 or 12.169)

Similar to 12.168, but without laboratory.

12.171 Analytical Chemistry 4 Q.H.*

(Prereq. 12.119 or equiv.)

For nonchemistry majors. The course encompasses the theories, principles, and applications

of volumetric, gravimetric, and instrumental methods of analysis.

12.172 Analytical Chemistry 5 Q.H.*

(Prereq. 12.119, 12.128, or equiv.)

For chemistry majors and selected students in other majors. Course covers principles, applications, and methods of analytical chemistry. Selected topics in data interpretation and chemical measurement are included.

12.179 Instrumental Analysis 5 Q.H.*

(Prereq. 12.162 and 12.172)

Course focuses on principles, methods, and applications of selected topics in electrometric, chromatographic, and opticometric chemical analysis.

12.180 Chemical Oceanography 4 Q.H.*

(Prereq. 12.115, 12.119, 12.128, or equiv.)

The course examines chemistry of seawater and sea sediments; methods and techniques of chemical oceanography.

12.181 Instrumental Analysis 3 Q.H.

(Prereq. 12.171, 12.172, equiv.)

For nonchemistry majors only. Similar to 12.179, but without laboratory.

12.213 Inorganic Chemistry 4 Q.H.

(Prereq. 12.168)

Topics include atomic properties of free atoms and ions. Ionic bonding and the structure of the solid state. The Madelung calculation; the Born-Haber and other thermodynamic cycles. Valence-bond, molecular, orbital, and crystal field theories of bonding. Stereochemistry of compounds of representative elements. Electron-deficient compounds. Spectral and magnetic properties of transition metal compounds.

12.221 Polymer Chemistry I 3 Q.H.

(Prereq. 12.155 or equiv.)

The course provides an introduction to polymers. Major emphasis on synthesis. Step-reaction, chain-reaction, and ring-opening polymerizations. Copolymerization. Three-dimensional polymers and cross-linking. Corresponds to graduate course 12.901.

12.222 Polymer Chemistry II 3 Q.H.

(Prereq. 12.162 or equiv.)

Topics include physical chemistry of polymers in solution and bulk. Molecular characterization. Mechanical and physical properties in the glassy, rubbery, viscous, and semicrystalline states. Corresponds to graduate course 12.902.

12.223 Polymer Chemistry III 3 Q.H.

(Prereq. 12.221 and 12.222)

Topics include industrial practice, polymer processing, fibers, elastomers, coatings, adhesives, reinforced plastics. Relation of polymer structure to usage. Corresponds to graduate course 12.903.

12.252 Advanced Organic Chemistry I 3 Q.H.

(Prereq. 12.155 or 12.145)

Course focuses on organic structure and reactions. Corresponds to graduate course 12.861.

12.253 Identification of Organic Compounds

(Prereq. 12.145 or 12.155)

3 Q.H.*

The course examines qualitative analysis of organic compounds and mixtures, using physical, chemical, and instrumental methods.

12.254 Advanced Organic Chemistry II 3 Q.H.

(Prereq. 12.252)

The course examines organic structure and reactions. Corresponds to graduate course 12.862.

12.255 Advanced Organic Chemistry III 3 Q.H.

(Prereq. 12.254)

The course focuses on organic structure and properties. Corresponds to graduate course 12.863.

12.256 Spectrophotometric Identification of Organic Compounds 3 Q.H.

(Prereq. 12.155 or equiv.)

The course examines spectrophotometric identification of organic compounds. Corresponds to graduate course 12.866.

12.257 Advanced Analytical Chemistry III

(Prereq. 12.179 or equiv.)

3 Q.H.

The course examines analytical separations. Corresponds to graduate course 12.821.

12.258 Advanced Analytical Chemistry II 3 Q.H.

(Prereq. 12.179)

Electroanalytical. Corresponds to graduate course 12.822.

12.259 Advanced Analytical Chemistry I 3 Q.H.

(Prereq. 12.179 or equiv.)

The course covers optical methods of analysis. Corresponds to graduate course 12.823.

12.262 Advanced Physical Chemistry I 3 Q.H.

(Prereq. 12.168)

The course examines chemical thermodynamics. Corresponds to graduate course 12.881.

12.263 Advanced Physical Chemistry II 3 Q.H.

(Prereq. 12.168)

The course focuses on atomic and molecular structure. Corresponds to graduate course 12.885.

12.264 Advanced Physical Chemistry III 3 Q.H.

(Prereq. 12.168)

The course focuses on chemical kinetics. Corresponds to graduate course 12.893.

12.266 Advanced Inorganic Chemistry I 3 Q.H.

(Prereq. 12.213)

The course covers application of quantum chemistry to inorganic systems. Corresponds to graduate course 12.841.

12.267 Advanced Inorganic Chemistry II 3 Q.H.
(Prereq. 12.266)

Continuation of 12.266. Corresponds to graduate course 12.842.

12.268 Advanced Inorganic Chemistry III 3 Q.H.
(Prereq. 12.267)

Chemistry of the solid state. Corresponds to graduate course 12.843.

12.274, 12.275, 12.276, 12.277, 12.278, 12.279
Undergraduate Research (each) 4 Q.H.

For chemistry majors. The course offers original experimental work under the direction of a staff member. Participation may begin in the middler year and will normally continue through the senior year. A minimum of a two-quarter com-

mitment is required for participation. Approval of the administering committee is required.

12.284 Advanced Chemical Synthesis 3 Q.H.*
Special projects in the synthesis of organic and/or inorganic compounds.**12.286 Advanced Chemical Measurements**
(Prereq. 12.168 and 12.179) **3 Q.H.***
Laboratory problems in analytical and/or physical chemistry are examined.**12.288 Special Topics 4 Q.H.**
(Prereq. 12.168)**12.295, 12.296, 12.297, 12.298 Junior-Senior Honors Program (each) 4 Q.H.**

For prerequisites and other details, see the section on the Junior-Senior Honors Program on page 5.

Earth Sciences

16.109 Environmental Geology 4 Q.H.

The course discusses how geologic processes acting at the earth's surface interact with the human environment. Topics include river and ocean flooding, coastal erosion, landslides, land-use planning, and waste disposal.

16.110 Geologic Hazards and Resources 4 Q.H.

The course discusses how geologic processes originating deep inside the earth interact with the human environment. Topics include global crustal movements, volcanic and earthquake hazards, mineral resources, coal and oil, geothermal energy, resource management, and disposal of radioactive wastes.

16.130 Marine Resources 4 Q.H.

The course provides a qualitative and quantitative survey of renewable and nonrenewable resources from the sea. Aspects covered include offshore oil and gas utilization, marine minerals, and tidal power; coastal zone recreational resources, including polluted beaches and artificial fishing reefs.

16.131 Physical Oceanography 4 Q.H.

The course provides a description of the physical properties and composition of sea water, waves, tides, and ocean currents. The course discusses how these properties are measured by oceanographers and how they influence the earth's environment and climate.

16.132 Biological Oceanography 4 Q.H.†

Topics include the productivity of animal and plant life in the various zones of the ocean; the growing economic importance of the oceans as a source of food for the expanding world population.

16.139 Geological Oceanography 4 Q.H.

In this course the form of the ocean basins and their margins is related to the major processes forming them. Emphasis is placed on local landforms, including New England beaches, spits, barrier islands, and the continental shelf.

16.161 Observational Astronomy 4 Q.H.

The course offers an introduction to the night sky by confrontation technique. Identification of the permanency of the circumpolar region. A systematic analysis of the available hour-angle constellations. Relevant supportive data provided for each nightly viewing. Continuous records of the characteristic behavior of the sun, moon, and available naked-eye planets. Periodic out-of-doors viewing sessions with binoculars and telescopes (amateur quality), especially on occasions of special phenomena, i.e., meteor showers and comets. Explanatory instructional information during open portions of class periods by lecture, lecture-demonstration, or planetary sessions.

16.165 Planetary Astronomy 4 Q.H.

This course focuses on astronomy of the solar system. Topics include description of the planets and other objects with discussion of how our understanding has evolved from the days of naked-eye observation to the present era of interplanetary probes.

16.168 Observational Astronomy 5 Q.H.

An introduction to systematic observation of the night sky, this course emphasizes observation and description of the patterns and motions of celestial bodies as seen with the unaided eye. Nightly viewing sessions required; supplemented by training sessions in the planetarium.

*Lab fee required.

†Including lab.

16.192 North America and the Ice Age 4 Q.H.
This course focuses on description and history of ice-sheets that have advanced and retreated across the northern U.S.A. and Canada during the last three million years. Topics include evidence of past climatic change and predictions of future change, fluctuating sea levels, and the impact of these changes on man and the environment.

16.201 Physical Geology 4 Q.H.
The course offers a systematic study of the materials comprising the earth. Topics emphasized include the processes by which rock is formed, transported, altered, and destroyed, as well as the nature and development of landscape.

16.202 Historical Geology 4 Q.H.
The physical and biological history of the earth is traced through geologic time. Major topics are the origin and evolution of life, mountain building, and continental drift.

16.203 Physical Geology Laboratory 1 Q.H.
(Prereq. 16.201; may be taken concurrently)
Optional laboratory for 16.201, Physical Geology. Laboratory exercises pertain to mineral and rock identification and topographic and geologic map interpretation. Required for geology majors.

16.204 Historical Geology Laboratory 1 Q.H.
(Prereq. 16.202; may be taken concurrently)
Course offers a study of fossil representatives of major invertebrate phyla, application of fossils to studies of rock sequences, interpretation of geologic history from geologic maps.

16.206 Rock Identification Laboratory 1 Q.H.
(Prereq. 16.215; may be taken concurrently)
The course provides self-paced laboratory exercises in the identification and classification of common rocks.

16.214 Geochemistry 4 Q.H.
(Prereq. One year of chemistry)
The course offers an evaluation of chemical processes important in the various geologic environments and their effects on the development of the lithosphere.

16.215 Descriptive Mineralogy 5 Q.H.
(Prereq. Two quarters of chemistry)
The course provides a study of mineralogy, including crystallography and physical, chemical, and descriptive mineralogy of the common rock-forming minerals. (Formerly 16.211)

16.217 Optical Crystallography 5 Q.H.
(Prereq. 16.215)
The theory and the practical methods of optical crystallography are studied, including the basic techniques for determining the optical constants of crystals using the polarizing microscope and immersion media. (Formerly 16.212)

16.218 Petrography 5 Q.H.
(Prereq. 16.217)
Topics include description and identification of rocks and rock-forming minerals using thin-

sections and the petrographic microscope; discussion of textural and mineralogic relationships. (Formerly 16.213)

16.219 Igneous and Metamorphic Petrology 5 Q.H.
(Prereq. 16.218)
The course covers the origin and distribution of igneous and metamorphic rocks as interpreted from their chemistry, mineralogy, and field relationships. Laboratory includes field and petrographic analysis of rock suites. (Formerly 16.216)

16.225 Sedimentation and Sedimentary Environments 5 Q.H.
(Prereq. 16.202)

The course offers a description of the physical processes of sedimentation and their role in the interpretation of modern and ancient sedimentary environments. Laboratory concentrates on the interpretation and description of the physical and textural properties of sediments and sedimentary rocks.

16.226 Sedimentary Petrology 5 Q.H.
(Prereq. 16.217)

Topics include origin, classification, and petrography of the major groups of sedimentary rocks. Discussion of the environments of deposition of the nonclastic rocks. Laboratory concentrates on thin-section study of sedimentary rocks. (Formerly 16.222)

16.227 Stratigraphy 5 Q.H.
(Prereq. 16.202)

Course offers study of paleoenvironments and sedimentary-basin analysis based on sedimentary structures, stratigraphic sequences, and fossils. Emphasis is on use of geologic sections, drill-cores, and well-logs. Laboratory interpretation of sedimentary rock suites, maps, and sections. (Formerly 16.221)

16.231 Glacial and Pleistocene Geology 4 Q.H.
(Prereq. 16.202)

The course covers the processes of ice movement and the characteristics and distribution of erosional and depositional structures associated with past and present glaciers; introduction to Pleistocene chronology and correlations.

16.232 Geomorphology 4 Q.H.
(Prereq. 16.201)

The course focuses on the origin and evolution of landscape features by processes operating at or near the earth's surface.

16.233 Coastal Processes 4 Q.H.
(Prereq. 16.201)

The course examines the effect of coastal marine processes and the resultant coastal responses. Topics include the dynamics of waves and currents and the associated erosion, transportation, and deposition of sediment forming beaches, barrier islands, and cliffed structures.

16.235 Landform Interpretation**4 Q.H.**

The course focuses on the origin and evolution of landscapes, which may be interpreted on the basis of the size, shape, orientation, composition, and distribution of topographic features. Particular attention is given to the effects of different climates on landscape evolution. The use of topographic maps, geologic maps, and stereo-aerial photographs is emphasized.

16.237 Marine Geology**4 Q.H.**

(Prereq. 16.201)

The balance between major sedimentary and tectonic forces in ocean basins and margins is compared to resulting ocean form. Topics include origin of continental shelves, shelf sedimentation and transport, deep-sea processes and sediments. Resource development of OCS oil, sand and gravel, and manganese nodules is evaluated.

16.240 Structural Geology**5 Q.H.**

(Prereq. 16.201 and 16.203)

Description and origin of large- and small-scale rock structures with emphasis on interpretation of the mechanics of deformation. Field and laboratory analyses of structural problems using maps, models, and rock specimens.

(Formerly 16.241)

16.242 Geophysics**4 Q.H.**

(Prereq. 11.117)

This course offers a study of basic techniques of reflection and refraction seismology, gravity, aeromagnetic, and heat-flow techniques and the information they provide on the structure, composition, and dynamics of the earth's interior. Emphasis is placed on the application of these techniques to the search for economic minerals in the earth's crust.

16.245 Economic Geology**4 Q.H.**

(Prereq. Dept. approval)

The course focuses on the genesis, associations, and occurrence of the major ore minerals, illustrated by studies of selected ore bodies of various types throughout the world.

16.246 Field Geology**4 Q.H.**

(Prereq. 16.201)

The course focuses on field techniques as a working guide for the approach, pursuit, and solution of geologic problems. Among the techniques considered are geologic map construction, stratigraphic section measurement, and field rock description. The laboratory consists of field research at a quarry, roadcut, or other geologic exposure.

16.261 Advanced General Geology**4 Q.H.**

(Prereq. 16.201 and 16.202)

The course offers an introduction to new and advanced concepts, theories, and hypotheses in geology. Students participate actively in discussions, research papers, and individual projects. Topics may include continental drift, sea-floor spreading, uniformitarianism, peneplanation, evolution, origin of magma, and origin and geologic history of the moon.

16.252 Invertebrate Paleontology**5 Q.H.**

(Prereq. 16.202)

Survey of the major invertebrate phyla preserved in the fossil record. Micro- and macro-evolutionary principles are discussed with consideration of adaptive and functional morphology and the role of paleoenvironments. Laboratory involves description and classification of fossil invertebrates.

(Formerly 16.251)

16.271 Geology Seminar**4 Q.H.**

(Prereq. Major in geology or senior status)

The course offers in-depth study, on an individual or small-group basis, of a selected geologic topic. Both oral and written presentations are required.

16.287, 16.288 Undergraduate**Research****(each) 4 Q.H.**

The course offers independent research on a selected topic under the direct supervision of a faculty member. Open only to juniors and seniors majoring in geology, with the recommendation of the supervising faculty member and of the department.

16.290, 16.291 Directed Study**(each) 4 Q.H.**

The course offers independent study of a specific topic not normally contained in the regular course offerings, but within the area of competence of a faculty member. Open to all students with the recommendation of a faculty member and departmental approval.

16.292, 16.293 Special Studies**(each) 1 Q.H.**

The course offers an independent study of a specific topic. Open to all students with the recommendation of a faculty member and departmental approval.

16.295, 16.296, 16.297, 16.298 Junior-Senior**Honors Program****(each) 4 Q.H.**

For prerequisites and other details, see the section on the Junior-Senior Honors Program on page 5.

Biology

For specific information about terms during which courses are offered, students should inquire at the main office of the Biology Department, 403 Richards Hall. This is especially the case for students wishing to carry a minor in biology, since some courses acceptable only for a minor do not appear in the quarterly Elective Course Selection Booklets. Students should note that courses are presented by category and are not listed in a single numerical sequence.

The following courses are primarily for students with little or no background in college science and mathematics. These courses are not open to biology majors.

18.107 Marine Biology 4 Q.H.

(Not open to biology majors)

The course provides an introduction to marine life with an emphasis on that of New England shores, and includes concepts of life cycles, adaptation of organisms, productivity, disturbance effects due to pollution and/or man and how they interrelate.

18.114 Human Anatomy I and Physiology I

(Not open to biology majors)

5 Q.H.*

The course focuses on cellular and tissue structure and function, followed by anatomical terminology. Topics include histology, anatomy, and physiology of bones, muscles, blood, and nervous systems. The laboratory includes a study of human bones, cat dissection, and related histology.

18.115 Human Anatomy II and Physiology II

(Not open to biology majors)

5 Q.H.*

The course covers anatomy and physiology of the respiratory, digestive, urogenital, and circulatory systems; physiology of endocrine system; a brief exploration of the anatomy and physiology of eye and ear. The laboratory includes studies of muscle and nerve physiology, blood physiology and histology, and physiology of respiration.

18.116 The Human Organism

4 Q.H.*

(Not open to biology majors)

This course, designed for nonscience majors, provides an introduction to the structure and function of the human body. Emphasis is on the principles of biological and physical science as they relate to life processes in health and disease. Laboratory experiments explore the workings of the students' own biological systems rather than those of other animals.

18.118 Organic Evolution

4 Q.H.

(Not open to biology majors)

The course focuses on the major features of organic evolution, with emphasis on vertebrate evolution, genetics, and physical influences.

18.119 Environment and Man

4 Q.H.

(Not open to biology majors)

The course offers an ecological analysis of man's interaction with other organisms. The necessary foundation of biological principles is presented.

The following courses are primarily for students majoring in science- or health-related professions or other majors (non-biology) with equivalent background in college science and mathematics. These courses are not open to biology majors.

18.106 Ecological Principles

4 Q.H.

(Prereq. Non-biology science majors or engineering majors)

Identical to 18.134, but without lab. Not open to biology majors.

18.120 Basic Microbiology

4 Q.H.

(Prereq. 18.141, or permission of instructor; not open to biology majors)

Microbial life, emphasizing morphological characteristics, physiological activities, and disease production. Laboratory.

18.121 Introductory Microbiology

3 Q.H.

(Not open to biology majors)

Similar to 18.120, but without laboratory.

18.141 Basic Animal Biology I

4 Q.H.*

(Not open to biology majors)

The course covers principles of biology; universal properties and processes of living organisms as exemplified by the cell and its activities; inheritance evolution; and environmental relationships. Laboratory.

18.142 Basic Animal Biology II

4 Q.H.*

(Prereq. 18.141; not open to biology majors)

The course offers systematic, comparative study of the structure and functions of animals. Diversity of animals is considered from the standpoint of evolutionary adaptation. Laboratory.

18.143 Human Physiology I

4 Q.H.*

(Prereq. 18.131 and 18.132; not open to biology majors)

The course offers study of the physiology of excitable cells and tissues: nerve and muscle

*Lab fee required.

synapses, muscular contraction, neuromuscular reflexes, autonomic nervous system, endocrinology, sensory physiology, and higher nervous function.

18.144 Human Physiology II 4 Q.H.*

(Prereq. 18.143; not open to biology majors)

The course offers study of respiration and circulation: fluids, the heart, cardiovascular regulatory mechanisms and metabolism, gastrointestinal function, renal function. Laboratory.

18.123 Biology of Human Reproduction 4 Q.H.

(Not open to biology majors)

The course covers structure and function of male and female reproductive systems; factors affecting sexual development, fertility, and reproductive behavior in the human species; physiology of coitus, fertilization, pregnancy, birth, and lactation; methods of controlling fertility.

18.148 Human Anatomy 4 Q.H.*

(Not open to biology majors)

The course focuses on the structure and development of the human body. Laboratory.

18.221 General Microbiology 3 Q.H.

(Prereq. Permission of instructor; or 12.145, 18.135, and 18.136; required courses may be taken concurrently)

Same as 18.220, but without laboratory. Not applicable for the biology major or graduate credit.

Courses primarily for biology majors or for other students with equivalent background in college science and mathematics. Freshmen intending to major in biology should take the sequence 18.111 to 18.113.

18.111 Principles of Biology I 5 Q.H.*

An introduction to the basic principles of biology, the course endeavors to provide an information base for the remainder of the biology core. Topics include scientific method, growth, development, elementary genetics, nutrition, photosynthesis, and respiration. Special emphasis is placed on the role of plants in the biological world. Laboratory.

18.112 Principles of Biology II 5 Q.H.*

(Prereq. 18.111)

Topics include cellular metabolism, molecular mechanisms of microbial life, structure and general physiology of animal cells, and evolution of adaptive diversity among invertebrate animals. Laboratory.

18.113 Principles of Biology III 5 Q.H.*

(Prereq. 18.111 and 18.112)

The course covers discussion of the structure and function of vertebrate animals, including the human species; introduction to the various systems of the body, illustrated with laboratory experiments and animal dissection.

*Lab fee required.

18.131 General Biology 4 Q.H.*

The course focuses on universal properties and processes of living organisms. Topics include cellular composition and cellular control, the evolutionary process, environmental relationships. Laboratory. (Normally not for freshman biology majors)

18.132 Animal Biology 4 Q.H.*

(Prereq. 18.131)

The course offers a systematic comparative study of the structure and functions of animals. Diversity of animals is considered from the standpoint of evolutionary adaptation. Laboratory. (Normally not for freshman biology majors)

18.133 Plant Biology 4 Q.H.*

(Prereq. 18.131-18.132 or 18.111-18.113)

The course offers an introduction to the structure of plant cells, structure and function of roots, stems, and leaves of flowering plants; survey of the major groups in the plant kingdom, including their morphology, reproductive biology, and economic importance. Laboratory.

18.134 Environmental and Population

Biology

4 Q.H.*

(Prereq. 18.131-18.133 or 18.111-18.113)

The course offers detailed consideration of the physico-chemical factors influencing and influenced by organisms. The course covers interactions among individual organisms and among species; change of species by genetic natural selection; development of communities and function of ecosystems. Laboratory.

18.135 Genetics and Development Biology

(Prereq. 18.131-18.133 and 12.144)

4 Q.H.*

Course focuses on elaboration of the classic laws of heredity, cytogenetics, molecular basis of heredity, and selected examples of the development of form and function. Laboratory.

18.136 Cell Physiology and Biochemistry

(Prereq. 18.131-18.135, 12.145,

4 Q.H.*

and 12.171)

Topics include basic chemical and physical enzyme kinetics; processes of cells related to their fine structure; oxidative and intermediary metabolism; photosynthesis, membrane phenomena; chemical and physical processes of prokaryotic and eukaryotic cells. Laboratory.

Note: Biochemistry courses that are sequels to 18.136 are listed under interdisciplinary course numbers (93.--).

18.158 Vertebrate Physiology I 4 Q.H.*

(Prereq. 18.131-18.133 and 18.136)

The course covers properties of living protoplasm; the general organization and function of cells; translocation of materials and the organization of animals; the physiology of the skeletal systems of humans and animals; the physiology of amoeboid, ciliary, and contractile

movement with emphasis on muscle metabolism; the structure and function of neurons, reflex arcs, the autonomic nervous system, and the sensory receptors. Laboratory.

18.159 Vertebrate Physiology II 4 Q.H.*
(Prereq. 18.158)

Topics include fluid media of animals, emphasizing water and electrolyte balance and kidney function in humans; the physiology of blood, including its formation, functions, clotting antigens, and tests for identifying blood; the physiology of the heart, nervous control of the vascular system, breathing and gas transport, heat regulation, nutrition, digestion and assimilation; the endocrine secretions; and the physiologic aspects of reproduction.

18.206 Evolution 4 Q.H.*
(Prereq. 18.131-18.135)

This is a basic evolutionary course for biology majors and graduate students offering a survey of evolutionary history, evidence, mechanisms, and theories. Topics of current interest in evolution are emphasized.

18.207 Vertebrate Zoology 4 Q.H.*
(Prereq. 18.131 and 18.134)

Lectures emphasize the systematics, natural history, zoogeography, and behavior of all classes of vertebrates. The laboratory consists of identification of preserved specimens and mandatory field and museum trips.

18.208 Comparative Vertebrate Anatomy 5 Q.H.*
(Prereq. 18.131 and 18.132)

The course focuses on morphology and phylogeny of the vertebrates; laboratory studies on taxonomy of the group and specific morphology of the dogfish shark, the mud puppy, the alligator, and the cat.

18.209 Embryology 5 Q.H.*
(Prereq. 18.131, 18.132, and 18.135)

Topics include gametogenesis, fertilization, cleavage, gastrulation, induction, organogenesis, and metamorphosis in vertebrates. Emphasis is on frog, chick, and pig in the laboratory.

18.210 Marine Invertebrate Zoology 5 Q.H.*
(Prereq. 18.131-18.133)

Topics include functional morphology, systematics, ecology, and phylogenetic relationships of the major invertebrate phyla. Emphasis in laboratory is on utilization of living marine forms, with dissection of representative organisms.

18.211 Parasitology 4 Q.H.*
(Prereq. 18.131 and 18.136)

The course focuses on symbiotic relationships of protozoans, mesozoans, flatworms, nematodes, acanthocephalans, and arthropods. Laboratory.

18.212 Vertebrate Paleontology 4 Q.H.*
(Prereq. 18.131, 18.132, 18.134, 18.135; or permission of instructor)

The course examines evolution of the vertebrates, including humans, as revealed through the fossil record. Laboratory, museum, and field studies.

18.216 Herpetology 4 Q.H.**
(Prereq. 18.132 and 18.135)

Lectures emphasize the natural history, behavior, systematics, and zoogeography of recent amphibians and reptiles. The laboratory consists of identification and preparation of preserved specimens, particularly local amphibians and reptiles. Mandatory field trips.

18.217 Mammalogy 5 Q.H.*
(Prereq. 18.131-18.134)

The course offers study of phylogeny, anatomy, physiology, and natural history of mammals. Field collection, laboratory preparation, and study of specimens are included. Laboratory.

18.219 The Microbial World 4 Q.H.*
(Prereq. 18.134 and 12.144)

The course offers study of the position, structure, and function of microorganisms in the natural world, and their utilization by humans from the perspective of their major physiological properties. Laboratory.

18.220 General Microbiology 5 Q.H.*
(Prereq. Permission of instructor; or 12.145, 18.135, or 18.136; required courses may be taken concurrently)

The course provides morphological, ecological, and biochemical consideration of representative groups of bacteria; introduction to virology and microbial genetics; host-parasite relationships, including basic immunological considerations; prokaryotes of medical significance; physical and chemical controls of microbial growth. Laboratory.

18.222 Medical Virology 4 Q.H.*
(Prereq. 18.220)

The course examines fundamental characteristics of animal viruses with emphasis on pathogenesis, clinical pathology, and epidemiology of the common viral diseases, including the tumor viruses and the slow viral diseases. Laboratory sessions focus on methods of working with animals, eggs, and cell cultures in isolating, cultivating, and identifying viruses.

18.227 Animal Histology 4 Q.H.*
(Prereq. 18.132)

The course offers microscopic study of fundamental types of animal tissues. Laboratory.

18.228 Histological Technique 3 Q.H.*
(Prereq. 18.131 and 18.136)

The course provides instruction in general methods of tissue preparation for purposes of

microscopic study; preparation of solutions and stains; the microtome and its operation, together with specific directions for fixation, clearing, hardening, embedding, section-cutting, and staining tissues. Laboratory.

18.230 Marine Botany 4 Q.H.*

Subjects covered include taxonomy of the major groups of marine plants, primarily algae; their ecological and reproductive strategies and their economic importance; and their roles in diverse marine communities. Mandatory field trips in addition to laboratory studies.

18.231 Lower Plants 4 Q.H.*

(Prereq. 18.133)

The course offers study of nonvascular plants (algae, fungi, lichens, mosses, and liverworts), including their morphology, ultrastructure, ecology, life cycles, reproductive strategies, and economic uses. Laboratory.

18.232 Higher Plants 4 Q.H.*

(Prereq. 18.133)

The course offers study of vascular plants (club mosses, ferns, gymnosperms, and angiosperms). Origin, ecology, development, structure, paleobotanical evidence, reproductive strategies, and economic uses. Field trips included. Laboratory.

18.234 Plant Anatomy 4 Q.H.*

(Prereq. 18.133)

The course focuses on comparative developmental anatomy of seed plants. Laboratory.

18.235 Economic Botany 4 Q.H.*

(Prereq. 18.133, or 18.111-18.113)

The course offers an in-depth study of the association of plants and men. Subjects include food, beverage, drug, fiber, and medicinal products and crops, both historically and in present-day usage. Laboratory includes making of several plant products (paper, dried fruit, beer, etc.) as well as tours of a brewery, wholesale grocers, ethnic markets, sugar factory, and other places as time permits.

18.236 Horticulture 4 Q.H.*

(Prereq. 18.133 or equiv.)

The course examines basic cultivation methods for ornamental and food plants. Offered at the University greenhouse. Laboratory.

18.238 Local Flora 4 Q.H.*

(Prereq. 18.133)

The course provides a study of local vascular flora (ferns, gymnosperms, and angiosperms), with emphasis on recognition and appreciation of plant family characteristics. Preparation of herbarium specimens is presented. Field trip attendance is required. Laboratory.

18.240 Microbial Physiology 4 Q.H.*

(Prereq. 18.220 or equiv.)

The course focuses on structure and function of the bacterial cell, with emphasis on its general

properties as well as on the physical and chemical factors that influence it. Laboratory.

18.242 Medical Microbiology 4 Q.H.*

(Prereq. 18.220 or equiv.)

Topics include host parasite interactions: virulence, toxins, natural flora, immunological responses; characteristics of the common bacterial, rickettsial, and protozoal infections in humans; epidemiology, pathology, vaccines, and chemotherapy.

18.245 Serology-Immunology 3 Q.H.

(Prereq. 18.220 or equiv.)

The course covers basic consideration of the physical and chemical attributes of antigens and antibodies. Antigens of biological significance as well as *in vivo* antigen-antibody interactions are discussed.

18.246 Serology-Immunology Laboratory

(Prereq. 18.245 taken concurrently) 2 Q.H.*

The course provides laboratory exercises dealing with immunization, quantitative antigen-antibody reactions, electrophoretic studies (agar, acrylamide gel, and cellulose acetate), immuno-fluorescence.

18.248 Marine and Fresh Water Microbiology I

(Prereq. 18.220) 2 Q.H.*

The course examines methodological approaches to the study of the aquatic environment. Shipboard sampling and relevant field trips augment laboratory studies.

18.249 Marine and Fresh Water Microbiology II

(Prereq. 18.220) 2 Q.H.

The course focuses on characterization and differentiation of aquatic micro-organisms. Topics include microbial associations in marine, estuarine, and fresh water habitats. Morphology, physiology, and ecology are stressed.

18.251 Comparative Animal Physiology 4 Q.H.*

(Prereq. 18.132 and 18.136 or equiv.)

The course offers study of animal functions, their control, and their adaptiveness to various environments with consideration of phylogeny of these adaptations and of their underlying cellular mechanisms. Emphasis is on invertebrates and lower vertebrates, with comparisons to mammals. Laboratory.

18.255 Comparative Neurobiology 4 Q.H.*

(Prereq. 18.136)

The course focuses on structure and function in simple invertebrate nervous systems. Topics include parallel conductance theory at endogenous and synaptic potentials, nerve networks, simple sensory and motor systems.

18.260 Advanced Cell Biology 4 Q.H.*

(Prereq. 18.136 and physics)

The course examines selected topics in cellular structure and function of eukaryotes, e.g., their electrical and mechanical characteristics and the underlying physical and biochemical

processes. Topics will vary depending upon the instructor. Laboratory.

18.265 Introduction to Plant Physiology 4 Q.H.*
(Prereq. 18.133 and 18.136, or permission of instructor)

The course focuses on the physiology and biochemistry of plants as a whole and at the cellular and organ levels. Considerations of mineral nutrition, photosynthesis, hormones, growth, and development are included. Attendance at a weekly four-hour lab, as well as preparation of a paper based on the research literature, are required.

18.280 Senior Seminar 1 Q.H.
(Prereq. Completion of biology core, 18.131-18.136)

The course examines recent developments in various topics of zoology, microbiology, physiology, botany, ecology, genetics, and cell biology. Student presentation and analysis are

emphasized. Limited to qualified juniors and seniors in the B.A. program and required of seniors in the B.S. program.

18.290, 18.291 Directed Study (each) 2 Q.H.
(Prereq. Completion of biology core, 18.131-18.136)

The course offers independent work on a chosen topic under the direction of members of the Department. Limited to qualified juniors and seniors with approval of the Department and special arrangements with the supervising faculty member. The two quarters of this course together are counted as one elective course in the Biology Department.

18.295, 18.296, 18.297, 18.298 Junior-Senior Honors Program (each) 4 Q.H.
For prerequisites and other details, see the section on the Junior-Senior Honors Program on page 5.

Psychology

For specific scheduling information, students should request a current course listing at the main office of the Psychology Department, 234 Nightingale Hall. Students should note that courses are presented by category and are *not* listed in numerical sequence.

Courses

19.105 Foundations of Psychology I 4 Q.H.
A survey of the fundamental principles and issues of the major areas of contemporary scientific psychology. The study of psychology is approached as a method of inquiry as well as a body of knowledge. Areas emphasized are biological bases of behavior, principles of learning, psychological testing, personality dynamics, psychopathology, and therapeutic approaches.

19.106 Foundations of Psychology II 4 Q.H.
(Prereq. 19.105)

A continuation of 19.105 with emphasis on the areas of life-span development, sensory and perceptual processes, cognition and memory, language, motivation and emotion, and social influences on behavior.

19.120 Statistics in Behavioral Science I 4 Q.H.
The course offers an introduction to descriptive statistics (scales of measurement, frequency distribution and graphs, measures of central tendency, dispersion and correlation, standard scores, and the unit normal curve), and probability theory (permutations, combinations, and the binomial theorem).

19.121 Statistics in Behavioral Science II 4 Q.H.
(Prereq. 19.120)

The course offers a general presentation of hypothesis testing, including parametric and

nonparametric tests, with emphasis on formulating hypotheses and choosing appropriate scales of measurement, tests, and confidence levels. (Continuation of 19.120)

19.130 Social Psychology 4 Q.H.
(Prereq. 19.106 or permission of instructor)

The course provides an introductory survey of social psychology. Topics include aggression, attribution, attitude formation, change, measurement, conformity, impression formation, group processes (social facilitation, deindividuation, etc.).

19.135 Personality I 4 Q.H.
(Prereq. 19.106)

The course offers a systematic study of the normal personality and its development. Topics include behavioral, dynamic, and constitutional determinants, assessment of personality, research, and a survey of the major theories of personality.

19.136 Personality II 4 Q.H.
(Prereq. 19.135)
Continuation of 19.135.

19.141 Human Behavioral Development I 4 Q.H.
(Prereq. 19.105)

This course examines the change in behavioral processes from conception up to, but not including, adolescence. Topics include: biological

*Lab fee required

bases of behavioral development, sensory and motor function, learning, socialization, speech and language, imitation, moral development, dependency, aggression, and abnormalities of development. Major theories of development and child-rearing practices are examined. Although relevant comparative research is considered, the emphasis is on human development.

19.142 Human Behavioral Development II 4 Q.H.
(Prereq. 19.141)

This course continues the examination of behavioral change from adolescence to death. Topics include: biological, intellectual, learning and memory, personality, and social processes. Different methods of study and theories of adult development are assessed.

19.153 Child Language 4 Q.H.
(Prereq. 19.155, linguistics, or permission of instructor)

The course provides a study of the manner in which language develops in children.

19.149 Sensation 4 Q.H.
(Prereq. 19.106)

The course provides an introduction to the study of our senses, with emphasis on hearing, touch, taste, and smell. Students have the opportunity to learn how we measure our sensory abilities. Findings are closely related to the functioning of sensory organs—ears, skin, mouth, and nose—and of the sensory nervous system.

19.150 Perception 4 Q.H.
(Prereq. 19.106)

The course offers a study of our awareness of the world around us exemplified primarily by visual perception. Topics are explored in group discussions and include light, visual sensory mechanisms, color vision, illusions, consciousness, and dreams.

19.151 Bilingualism 4 Q.H.
Half of the world's population is bilingual, that is, uses two or more languages on a regular basis. And yet bilingualism remains a poorly understood phenomenon surrounded by a number of myths, such as: bilinguals are found in bilingual countries and are equally fluent in their languages; bilingual children suffer from cognitive impoverishment; bilingual education hinders the assimilation of minority groups. The course will review all aspects of bilingualism (in the world, in society, in the child and the adult), as well as discuss topics such as biculturalism and language change.

19.152 Introduction to Phonetics 4 Q.H.
The course offers an introduction to the nature of the speech signal from articulatory, perceptual, and acoustic points of view. Topics include sound measurement, sound classes, and a survey and comparison of speech sounds used in languages in the world. Stress, tone, and intonation. Phonetic classification and tran-

scription of speech as practical tools for students of languages, linguistics, and speech and hearing science.

19.155 Language and Cognition 4 Q.H.
(Prereq. 19.106)

This course provides a basic introduction to the human cognition (cognitive psychology) and the psychology of language (psycholinguistics). On the subject of cognition, the course emphasizes the mental processes involved in the acquisition, organization, and use of knowledge, including pattern recognition and memory. On the subject of psycholinguistics, it focuses on the nature and structure of language, various theories of human production and perception of language, and related experimental findings.

19.156 Thought Processes in Children 4 Q.H.
(Prereq. 19.106)

The course offers an introduction to the processes of thinking, from infancy through adulthood. Specific topics include sensory-perceptual development, problem solving, concept attainment, and the development of social and cultural perspectives.

19.157 Cognition 4 Q.H.
(Prereq. 19.155)

Continuation of 19.155, focusing on cognition. This course emphasizes the analysis of perception, memory, and learning within an information-processing framework. Also considered are selected topics in cognitive development.

19.164 Learning and Motivation I 4 Q.H.
(Prereq. 19.106)

Application of basic behavioral principles to behavioral development, behavior modification, language development, and programmed learning, and their relations to theoretical considerations in the learning process.

19.166 Programmed Learning 4 Q.H.
(Prereq. 19.164)

Development of programmed instruction has been one of the products of basic behavioral research. After students master relevant basic research literature, they are expected to review and evaluate existing instructional programs in light of the underlying behavioral principles. Programs are selected from those useful in the normal and special education classrooms, i.e., complex academic subject matter and individual problem areas.

19.167 Applied Programming Techniques 4 Q.H.
(Prereq. 19.166 and permission of instructor)

Students design, test, and evaluate their own instructional programs for teaching specific subject matter, for remedial application to behavior problems, or for testing basic instructional theory.

19.168 Behavior Therapies 4 Q.H.
(Prereq. 19.106)

The course offers a study of successful projects

that have provided effective remediation and rehabilitation in institutions for the mentally ill, the mentally retarded, and the developing human (schools).

19.169 Learning and Motivation II 4 Q.H.
(Prereq. 19.164)

Continuation of 19.164 with emphasis on biological constraints on learning, i.e., punishment, anxiety, aggression, addiction; and other topics of individual interest.

19.170 Language Abnormalities 4 Q.H.
(Prereq. 19.155)

Topics include psycholinguistic methods and findings in the study of aphasia, stuttering, dyslexia, language of the retarded, and other language pathologies.

19.172 Applied Behavior Modification 4 Q.H.
(Prereq. 19.171 and permission of instructor)

Continuation of 19.171.

19.178 Physiological Bases of Psychology I 4 Q.H.
(Prereq. 19.106)

This is an introduction to the relation between brain function and human behavior. Topics include how nerve cells function individually and work together both in small networks and in the nervous system; the structure of the nervous system; how our sense organs provide the nervous system with information about the outside world; how the brain controls movement; and how psychological concepts such as perception and learning may relate to brain activity.

19.179 Physiological Bases of Psychology II 4 Q.H.
(Prereq. 19.178)

A continuation of 19.178 in which the relation between brain function and more complex behavior is examined. Topics include the multiple kinds of sensory information and the neuronal and hormonal control systems involved in eating, drinking, sexual and reproductive behavior; how brain activity is related to emotion, sleep, wakefulness, and memory; disorders of behavior and of the brain.

19.180 Neuropsychology 4 Q.H.
(Prereq. 19.178)

For students who desire intensive study, discussion, and practice in laboratory studies of physiological variables. Topics include evolution of the nervous system, sensory and motor mechanisms, motivation and emotion, sleep, attention and perception, learning, and memory.

19.183 Biological Bases of Motivation 4 Q.H.
(Prereq. 19.178)

The course focuses on the mechanisms of eating and drinking behavior, attention, sleep, arousal, and emotional behavior.

19.186 Comparative Psychology and Ethology 4 Q.H.
(Prereq. 19.106 and 19.178, or equiv. course in biology)

This introductory-level course in animal behavior surveys a wide range of species (reptiles, birds,

fish, and mammals, including humans) to find similarities and differences in the behavioral processes and physiological mechanisms by which individual organisms and species adapt to their environments. The first section of the course focuses on adaptive specializations exhibited by animals in learning about their environments during early development and as adults. The second section examines problems of social organizations at the individual level: how animals communicate with each other and transmit "cultural" skills; mechanisms underlying cohesion and dispersal (e.g., reproduction and aggression); and the adaptive advantages of being social or asocial. The final section provides students with an unusual opportunity to apply concepts and experimental methods they have learned by actually doing a short field study of animal behavior at The Boston Zoological Park.

19.189 Drugs, Brain, and Behavior 4 Q.H.
(Prereq. 19.178)

Examines, from a psychobiological perspective, different experimental approaches to the problems involved in uncovering the relations between changes in brain activity and changes in behavior produced by drugs. Material involves not only a general survey of the data collected with regard to drug/brain-behavior relations, but also current theorizing on the role of early experience, environmental factors, biological rhythms, and other factors in the determination of drug-induced behavioral changes.

19.192 Sensory and Perceptual Abnormalities 4 Q.H.
(Prereq. 19.150)

The course focuses on some of the peripheral factors that influence perception of the external world. Discussions consider the manner in which sensory deficits can influence behavior and some of the means of dealing with sensory and perceptual abnormalities. Application of programmed instruction to the development of sensory tests and remedial procedures for nonverbal people, blind or deaf retarded people, young children who have not yet learned to speak, and aphasic patients; the detection of hysterical sensory loss and malingering.

19.193 Neuroanatomy I 4 Q.H.
(Prereq. 19.106)

Aimed primarily at the study of the human nervous system, this course focuses on study of the cellular structure of the nervous system, including a cell's organelles, followed by a short study of the embryological development of the nervous system. Systematic study of the nervous system beginning in the spinal cord and ending in the cerebral cortex with primary emphasis on fiber connections. A continuous attempt to correlate structure with behavioral activity.

19.194 Neuroanatomy II 4 Q.H.
(Prereq. 19.193)

Continuation of Neuroanatomy I. Students are expected to participate in individual reports on selected topics concerning the nervous system.

19.202 Abnormal Psychology I 4 Q.H.
(Prereq. 19.135 or 19.141)

This course offers a study of the abnormal personality, including a historical survey and a discussion of such issues as anxiety, defense mechanisms, and the criteria of psychopathology. Also examined are the symptomatology, etiology, and dynamics of neuroses (hysteria, phobia, obsession, and compulsion) and of psychosomatic disorders. Details of case histories will be discussed.

19.203 Abnormal Psychology II 4 Q.H.
(Prereq. 19.202)

The course offers a survey of psychological and somatic therapies. Symptomatology, etiology, dynamics, and therapy of psychoses (schizophrenia, paranoia, mania, depression). Sociopathic and organic disorders.

Directed Study—Honors Courses

19.290, 19.291, 19.292, 19.293, 19.294

Directed Study (each) 4 Q.H.
(Prereq. Permission of instructor)

This course offers independent work under the direction of the Psychology Department, usually in a research project in one of the Department laboratories. Faculty members normally require completion of advanced laboratory courses in the area of research interest, but this is a matter of individual discussion. Students interested in Directed Study should consult a department adviser.

19.295, 19.296, 19.297, 19.298, 19.299 Junior-Seniors Honors Program (each) 4 Q.H.

For prerequisites and other details, see the section on the Junior-Senior Honors Program on page 5.

Laboratories**19.133 Laboratory In Social Psychology 4 Q.H.***
(Prereq. 19.121 and 19.130)

The course provides an introduction to the methods of social-psychological research. The purpose of the course is to assist students in developing the ability to read published social research with a critical eye, to pose questions in a testable manner, to apply experimental methods to social research, and to express themselves in APA-journal style.

19.138 Personality Laboratory 4 Q.H.*
(Prereq. 19.121 and 19.135)

The course provides an introduction to the methods and areas of personality research. Includes a discussion of problems of measure-

ment, control, and interpretation. Representative published experiments will be examined critically. Students are expected to design, collect data for, assess, and write up several experiments, including one original research project.

19.158 Cognition Laboratory 4 Q.H.*
(Prereq. 19.121 and 19.157)

Experiments related to topics in 19.155 and 19.157.

19.160 Experimental Design in Psychology 4 Q.H.*
(Prereq. 19.106 and 19.121)

The course focuses on the experimental method in the design, execution, analysis, and reporting of psychological investigations of humans and animals.

19.162 Sensation and Perception Laboratory 4 Q.H.*
(Prereq. 19.121 and 19.149 or 19.150)

Experiments involving precise measurements of both physical and psychophysical phenomena, including auditory function, color vision and after-effects, muscular sensation, tactile sensitivity, and adaptation to perceptual distortions.

19.165 Learning and Motivation Laboratory 4 Q.H.*
(Prereq. 19.121 and 19.164)

Through direct experience, students have the opportunity to gain proficiency in laboratory analysis of behavior and in evaluating common generalizations about human behavior. Students are expected to design and perform experiments in animal and human learning, memory, decision processes, concept formation, and other topics of individual interest.

19.171 Behavior Modification Laboratory 4 Q.H.*
(Prereq. 19.165 or 19.178, and permission of instructor)

Students have the opportunity to participate in education and training of severely and profoundly retarded residents at the Walter E. Fernald State School. Learning theory principles are applied to teaching new skills and to treating inappropriate behavior. Students have the opportunity to write individual and group training programs, implement them in a classroom setting, and learn methods for evaluating program success.

19.181 Laboratory in Physiological Psychology 4 Q.H.*

Laboratory experiments based on 19.180 discussion topics.

19.188 Sensory Physiology Laboratory 4 Q.H.*
(Prereq. 19.178)

Experiments are performed to illustrate the physiological techniques in sensory psychology, including electrical recordings of some activities that accompany visual, auditory, and cutaneous activity.

19.195 Laboratory in Psycholinguistics 4 Q.H.*
(Prereq. 19.120 and 19.155)

The course provides students the opportunity to acquire first-hand experience in conducting research on problems in the psychology of language. Students are involved in all aspects of each experiment, including collecting and analyzing data and preparing reports. Classroom discussion focuses both on the particular experiments conducted and on the implications of the experimental findings for broader issues in the psychology of language.

Seminars**19.187 Sensory Physiology Seminar 4 Q.H.**
(Prereq. 19.178)

The course concentrates on the psychophysiology of various sensory systems, vision and hearing in particular. Discussions are concerned with the problem of accounting for sensory phenomena in terms of physiological concepts.

19.270 Seminar In Behavior Theory 4 Q.H.
Topics vary from term to term. For specific information, call ext. 3793.**19.271 Seminar In Cognition 4 Q.H.**
Topics vary from term to term. For specific information, call ext. 3793.**19.272 Seminar In Psycholinguistics 4 Q.H.**
(Prereq. 19.155 or permission of instructor)

The seminar focuses on the on-line processing of language. Recent research is discussed in light of such questions as: While listening to someone speak, how does the listener process the information carried by the acoustic signal? What is the role of linguistic rules, prediction strategies, and contextual information? And when speaking, what processing stages are involved from the moment the speaker decides to speak to the moment the articulators start functioning? These and other questions will be discussed, as will experimental techniques and current trends in psycholinguistics.

19.273 Seminar In Clinical Psychology and Personality 4 Q.H.
(Prereq. 19.202 or permission of instructor)

The course offers seminar presentations of topics relevant to understanding the normal and disturbed personality. Possible topics: specialized assessment procedures, cognitive styles in personality, temperament, hypnosis, anxiety, aggression, specialized clinical syndromes, and the development of conscience.

19.274 Seminar In Sensory and Physiological Psychology 4 Q.H.
(Prereq. Permission of instructor)**19.275 Seminar In Social Psychology 4 Q.H.**
(Prereq. 19.130 and 21.107, or permission of instructor)

Students are expected to examine and present in class their findings on a particular topic in social psychology, for example, attribution, aggression, conformity, attitude-behavior relationship.

19.276 Seminar In Behavior Modification 4 Q.H.
(Prereq. 19.165)

Topics in behavior modification are discussed in a seminar format.

Teaching Practica

Students who have mastered one of the Department's self-paced courses may request permission to enroll in the correlated Teaching Practicum, with elective credit applicable to the major within the limits noted in the major requirements handbook. Students have the opportunity to learn how to design instructional materials, give tutorials, and solve study problems in the subject matter of the self-paced course.

19.250 Teaching Practicum In Foundations of Psychology I 4 Q.H.
(Prereq. 19.105 and permission of instructor)

This course is designed to assist students in learning practical teaching skills as well as theoretical principles associated with personalized instruction. Teaching responsibilities include interactions with students in 19.105 for four hours each week. In addition, a special Saturday conference and weekly staff seminars will provide opportunity for discussion and give the undergraduate the opportunity to become acquainted with relevant literature.

Topics in Psychology Series (TIPS)

General interest, no-prerequisite courses in psychology.

19.148 Sleeping and Dreaming 4 Q.H.

What makes us dream? How important are sleeping and dreaming to physical and mental health? To assist students in understanding the nature of sleeping and dreaming, this course draws on findings and theory in psychology and neurophysiology.

19.230 Psychological Testing: Science and Politics 4 Q.H.

After an analysis of the basic principles of psychological test construction and the characteristics of various tests, the course

*Lab fee required.

focuses on the political and sociological problems associated with psychological assessment. Emphasis is on the uses and misuses of tests; social, cultural, and racial issues in intelligence testing; and the heredity-environment controversy in I.Q. testing.

19.231 Marriage and the Family 4 Q.H.

Problems typical in some marriages are discussed, including alcoholism, sexual inadequacy and dissatisfaction, separation and divorce, death of a spouse, and child rearing.

19.232 Mind and Brain 4 Q.H.

The science of neuropsychology assumes that for every state of the mind—perceiving, thinking, dreaming, pleasure, pain, etc.—there is a corresponding brain state. This course examines explorations of brain function that have increased our understanding of experience and behavior. Contemporary questions to be discussed include: 1) How is it that a single human brain can store more information than all the libraries of the world? 2) What kind of brain is needed to make language possible? 3) What is the impact of brain damage on states of mind? 4) Is the child's brain more plastic than that of the adult? 5) Do psychological disorders result from a disruption of the natural harmony between the brain's chemistry and its environment? 6) What is the nature-nurture controversy about? 7) How did brains and consciousness evolve? 8) Are there male and female brains?

19.234 The Disordered Mind 4 Q.H.

This course may assist in providing an understanding of disturbed human behavior: how to recognize it, what causes it, and how to treat it. A wide range of disorders is discussed, from minor behavioral disturbances to neuroses, depression, and schizophrenia.

19.235 Animal Communication 4 Q.H.

How do animals communicate and how are we attempting to communicate with them? This course examines and compares the communication systems used by animals such as birds, bees, whales, dolphins, and the primates, including chimps and humans. From the four perspectives of biology, linguistics, psychology, and sociology, recent attempts to teach other primates some of our languages (sign language, speech, manipulation of tokens or computers) are revealing what it means to be a human in the animal kingdom.

19.238 Man in Isolation 4 Q.H.

Children raised in the wilds, children isolated in society, and adults placed in experimental isolation are the subjects of this course, designed to reveal what part of human nature actually requires interaction with other human beings, what part is programmed biologically, and how these work together to make us human.

19.238 Behavior Problems and Their Therapies

4 Q.H.

This course offers a broad introduction to behavior therapies and their use in treating behavioral problems such as fears and phobias, compulsions, overeating, educational difficulties (including inattention and poor study skills), alcoholism, marital and family difficulties, and sexual deviation. Theoretical, practical, legal, and ethical issues will be examined.

19.239 Infant Development

4 Q.H.

In the last few years, new techniques have provided psychologists with a means of asking more precise questions about infants—and some of the answers have been truly remarkable. It is becoming increasingly apparent that the infant possesses highly developed capacities and that its course of development involves a complex interaction between experience and these innate abilities. This course examines, in historical perspective, these new findings about infants, focusing on what is known about infancy and the various techniques used to study infant behavior. A number of aspects of development will be considered, including social, motor, perceptual, cognitive, and language.

19.244 Sexual Behavior

4 Q.H.,

This course is concerned with the sexual activities of the human male and female from infancy to adulthood. It considers the importance of sexual factors in the life history of the individual, statistical surveys of sexual behavior, and direct observational measures of sexual responding. Included are the nature of love, responses to pornography, prostitution, bisexuality, male and female homosexuality, rape, child abuse, and sexual therapy.

19.245 Your Memory: How It Works

4 Q.H.

This course provides an analysis of the operation of memory in humans and animals, including factors from learning and physiology. Special attention is given to human verbal and conceptual memory, and classic and modern systems for memory extension and improvement. Practical exercises on methods of remembering are included.

19.246 Psychology and the Law

4 Q.H.

How does psychology enter into the various phases of the judicial process? The class traces the effects of psychological factors through the course of a trial, including such issues as accuracy of eyewitness identification, plea bargaining, jury selection, persuasion tactics in the courtroom, presumption of innocence, jury size, jury decision rules, and sentencing and punishment.

19.247 Body Language 4 Q.H.

This course examines the messages we send by posture, facial expression, gesture, gait, and interpersonal distance. It goes on to explore how power, status, and gender affect nonverbal communication.

19.248 Magic and Illusion 4 Q.H.

This course investigates visual, auditory, and kinesthetic illusions and constancies,

demonstrating the manner in which we can be misled by our perceptions and how professionals, such as magicians (who will demonstrate certain topics), take advantage of this fact.

Note: See Modern Languages, 36.—for courses in American Sign Language (formerly 19.—).

Anthropology

20.100 Introduction to Anthropology 4 Q.H.

The course provides a survey of basic anthropological concepts, including human evolution, culture, and linguistics, with comparative analysis of such socio-cultural institutions as kinship, economy, polity, and religion, especially in nonwestern societies.

20.105 Visual Anthropology 4 Q.H.
(Prereq. 20.100)

This course explores the anthropologist's use of film to gather information and analyze cultural subsystems. In addition to reading about and viewing films on particular peoples, a "laboratory" aspect of the course involving the use of tape and video equipment introduces students to the field.

20.108 Cultural Meaning and Everyday Experience 4 Q.H.

This course uses anthropological ideas to study the underlying patterns of meaning that lie below the surface of everyday thought and behavior. Topics include study of daily routines, leisure activities, joking and humor, speech patterns, current folklore and mythology, non-monetary economic transactions, kinship and friendship relations, and religion and ritual.

20.120 Introduction to Archaeology 4 Q.H.

This course offers a survey of the history of development of archaeology focusing intensively on key sites in the new and old worlds. Film and slides of sites and artifacts are used extensively.

20.130 Language and Culture 4 Q.H.

Topics include the function of language in human society and an introduction to the relation between the patterns of language and the patterns of culture.

20.131 Folklore 4 Q.H.

This course focuses on cross-cultural comparisons of oral narrative traditions and literary sources. Various methods of analysis of folklore and its place and function in society and culture are examined. Identification of and methods for collecting material from local, currently active folklore traditions are given special attention.

20.132 The Anthropology of Music 4 Q.H.

This course offers an examination of music in a prehistoric and cross-cultural perspective, with emphasis on ethnomusicology and the comparison of western and nonwestern musical culture. Functions and social contexts of musical composition and performance; the ethnography of musical performance groups; the analysis of music as a form of communication.

20.135 Individual and Culture 4 Q.H.

This course explores the ways in which individuals are shaped by society and the ways in which they can effect change.

20.137 Culture and Mental Illness 4 Q.H.

This course offers discussions and analyses of the nature and meaning of culture, the role of culture in personality formation, culture and anxiety, anthropological approaches to the "normal" and the "abnormal," and the question "Is mental illness psychological fact or cultural fiction?"

20.140 Evolution and Society 4 Q.H.

This course focuses on human social and cultural evolution and the theories that account for it.

20.151 Aggression 4 Q.H.

Focuses on concepts of aggression and how they affect our understanding of human society. Draws on materials collected by anthropologists, psychologists, and ethnologists.

20.157 Primitive Religion 4 Q.H.

The course focuses on nature and institutionalization of "primitive" religion. Topics include exploration of religious concepts and movements in relation to social, economic, and political organization.

20.158 The Anthropological Study of Myth 4 Q.H.

The course focuses on theories concerning the nature and meaning of myth. Exploration of the function of myth in social and cultural change. The structural analysis of myth.

20.160 Sex, Sex Roles, and Family 4 Q.H.

The course analyzes popular and scientific notions about sex and family by examining the

social patterning of interactions in our culture, other cultures, and other species. Emphasizes the changing relations between men and women. (See also 21.121.)

20.170 Culture in Transition 4 Q.H.
The course offers analysis of the changing patterns in social, economic, and political institutions. Modern social trends are discussed.

20.210 Tribal Societies and Cultures 4 Q.H.
The course focuses on the structures and institutions of bands, tribes, and chiefdoms; comparative and functional studies of tribal societies and the dynamics of change under contact situations.

20.214 Peasant Society and Culture 4 Q.H.
Focuses on the dilemma of attempts by peasant societies to preserve traditional cultural forms in the face of increasing external economic and political pressures. Covers the origins of the peasantry, diversity and uniformity in peasant societies, the transformation of peasants into the modern urban and rural poor, and the politics of peasant protest and revolution.

20.215 Peoples Who Live by the Sea 4 Q.H.
Course material includes examination of fishing, trade, shipbuilding, recreation, smuggling, and other uses of the sea; the social ecology, lifestyles, economics, and politics of seacoast perspectives of evolutionary and community systems theory. Research projects dealing with current issues, site visits, and field trips are required.

20.220 Anthropology Methods 4 Q.H.
The course examines theory and practice of methods of field research and data analysis. Students have the opportunity to take part in a field project.

20.230 Language and Communication 4 Q.H.
The course focuses on human communication, including language, theories of the evolution of language; language and kinesics, semiotics, social class, linguistic nationalism; linguistic problems in modernization.

20.240 Human Origins 4 Q.H.
The course offers an intensive look at the data on fossil remains and contemporary primates, which are essential for an understanding of human physical and behavioral evolution. Efforts are made to bring the student into direct contact with primary materials.

20.245 Cultural Ecology 4 Q.H.
The course offers an introduction to questions of human adaptation to environment and the effect of different adaptations on natural systems.

20.250 Political Anthropology 4 Q.H.
The course investigates the origin and growth of the institutions of civilization. Topics include

specialization and social stratification in the dynamics of traditional civilizations. Some special topics of contact and change.

20.252 The Anthropology of Law and Conflict 4 Q.H.

Topics include settling disputes in stateless societies; forms and mechanism of social control; law as an indicator of cultural and social norms; the study of conflict resolution as an ethnographic tool. Some field research and analysis are required.

20.255 Economic Anthropology 4 Q.H.
The course examines types of economic systems in simple societies; reciprocal, redistributive, market exchange; economic relations as part of social relations; land-tenure systems, credit systems, savings mechanisms. The transition from subsistence to cash economics.

20.257 Religion and Myth 4 Q.H.
The course explores selected problems in anthropological studies in urban societies.

20.259 Urban Anthropology 4 Q.H.
The course explores selected problems in anthropological studies in urban societies.

20.260 Kinship and Society 4 Q.H.
This is a course for the advanced student only. A variety of kinship systems, their terminological and structural components, and the way in which they articulate with other social institutions are studied.

20.270 Social Change and Economic Development 4 Q.H.

Selected topics in the socioeconomic transformation of the world produced by the industrial revolution. Focuses on the impact of the modern world system on traditional cultures and contemporary Third World countries.

20.280, 20.281, 20.282, 20.283, 20.284, 20.285, etc.
(each) 4 Q.H.

These are ethnographic area courses (New World Indian, African, Indian, Mediterranean, etc.) which will be offered as the Department's resources permit.

20.290, 20.291 Directed Study 4 Q.H.
(Prereq. Department approval)

The course offers independent work on a chosen topic under the direction of members of the Department. Limited to qualified seniors preparing in anthropology with approval of the Department chairperson.

20.295, 20.296, 20.297, 20.298 Junior-Senior Honors Program (each) 4 Q.H.

For prerequisites and other details, see the section on the Junior-Senior Honors Program on page 5.

20.801, 20.802 Theory

Qualified undergraduates may wish to take this graduate school course. Permission of the instructor is required for registration.

Sociology

21.100 Introduction to Sociology 4 Q.H.

The course explores basic concepts and theories concerning the relation between individuals and society. Emphasis on the influence of culture, social structure, and institutions in explaining human activity. Social groups, socialization, community, class, power, and social change, among other substantive issues, will be discussed and analyzed.

21.103 Sociology of Boston 4 Q.H.

(Does not meet elective requirement for sociology/anthropology major)

The course examines the city of Boston from the perspectives of environmental development, neighborhood and intergroup relations, institutional services, and symbolic meanings. The city is a laboratory for exploring people's search for a lifestyle and the satisfaction of their needs. Field trips with workbook are required. Documentary and literary sources for term paper report are used.

21.107 Social Psychology 4 Q.H.

(Prereq. 21.100 or permission of instructor)

The course offers a socio-psychological approach to individual behavior in social contexts; introduction to basic concepts, such as socialization, identity, self-concept, role conflict, attitudes and attitude measurement, and groups and group processes, as well as an overview of major theoretical orientations and important substantive topics.

21.109 The Sociology of Everyday Life 4 Q.H.

The course examines the development, application, and consequences of rules for everyday activities (e.g., walking, talking, eating, drinking, sitting, smoking, laughing, crying, and sleeping); the effects of artifacts, culture, space, and territory on these activities, on social life, and on the expression of emotions.

21.110 Contemporary Japanese Culture and Society 4 Q.H.

Focus on contemporary Japanese urban society. Topics include: major values, family structure, sex roles, social control, the economy and the division of labor, mass media, religion, arts, and special problems.

21.111 American Society 4 Q.H.

(Prereq. 21.100 or equiv.)

The course focuses on American society, culture, and major social institutions: economic, religious, governmental, familial, educational, welfare, and recreational; social classes and stratification, mobility, and individualism.

21.112 Sociology of Poverty 4 Q.H.

The course offers an analysis of American poverty in historical perspective, drawing on comparisons with other countries. Critical evaluation of sociological research and theories relating to poverty. Consideration of causes and

effects of poverty, as well as societal responses to poverty and its consequences. Suitable for students in applied fields, such as nursing, criminal justice, education, allied health, pre-med, and pre-law.

21.116 Environment and Society 4 Q.H.

This course examines the complex relations between human populations and their environments. Issues such as energy, pollution, food supplies, resource availability, and conservation are treated as societal phenomena that involve human values and decision-making processes as well as technical information from a variety of scientific fields. The course will include practical experience in environmental problem solving.

21.118 Population and Society 4 Q.H.

The course examines traditional and contemporary approaches to human population and its control. Topics include factors affecting birth and death rates; societal implications of population quantity and quality in several situations, past and present; rural-urban migration and mobility; racial, genetic, stratificational components for population analysis. Public policies and responses to fertility control in several societies. International efforts to understand and generate action on population issues.

21.120 Sociology of the Family 4 Q.H.

Topics include the family as a social institution in several selected cultures; interrelations of the family and political, economic, and educational institutions; social nature of personality; role taking; individualism, mobility, and industrialism.

21.121 Sex-Gender Roles in a Changing Society 4 Q.H.

The course offers review and application of theories about the determinants of sex statuses and roles, from historical and cross-cultural perspectives. The focus of the course is on women's status in different institutional structures of American society.

21.125 The Sociology of Private and Public Assistance 4 Q.H.

The course offers analysis of the functions of society's private and public assistance efforts. The socio-political, economic, and psychological factors in public welfare and the helping professions.

21.131 Crime, Conflict, and Justice 4 Q.H.

The course offers analysis of social and political forces that create and perpetuate criminality in contemporary American society; the impact of criminality upon law enforcement, judicial process, and the social order. Particular attention is devoted to violence as a means of resolving problems. In addition, this course examines the legal system's involvement in processes of social conflict and change.

21.132 Class, Crime, and the Police 4 Q.H.

The course focuses on the relation between social class and crime, including power elite theory, class conflict, mobility patterns, and value orientations. White collar, professional, and "political" crime is discussed as is the relation between economic status and the functioning of the criminal justice system. The role of police and the interaction between law enforcement agents and deviants are analyzed, with emphasis on the potential for discriminatory application of the criminal law.

21.135 Juvenile Delinquency 4 Q.H.

The course examines the sociological and psychological approaches to and their implications for a typology of delinquency; problems of prevention, treatment, and rehabilitation.

21.136 Violence In the Family 4 Q.H.

The course offers an examination of the physical, emotional, and sexual violence that occurs in families, with particular emphasis on child and spouse abuse. Definitions, prevalence, causes, prevention, and treatment of specific cases of domestic violence are analyzed. Social policy issues and problems of legal intervention are a primary focus.

**21.137 Sociology of Deviance 4 Q.H.
(Formerly Social Deviance)**

The course explores the conditions under which people categorize others as different; processes by which persons so defined are assigned deviant status and assume appropriate roles and self-images; development of deviant careers and their relation to deviant subcultures; situations in which people transform deviant identity.

21.138 Social Control I 4 Q.H.

The course examines formation of social bonds and the conditions under which they are ruptured; the emergence of deviance as an interactional problem; individual and societal reactions to the most prevalent forms of deviant behavior. Analysis of agencies of social control, their definitions of problems, and responses to typical clients.

21.139 Social Problems 4 Q.H.

(Prereq. 21.100 or permission of instructor)

The course offers analysis of five major sociological perspectives on social problems (pathology, disorganization, value conflict, deviance, and labeling); the conditions under which certain recurrent events, activities, and persons become redefined as social problems (e.g., mine disasters, marijuana smoking, and alcoholism); study of the typical responses to social problems and their consequences.

21.141 Drugs and Society 4 Q.H.

The course offers an introduction to the sociology of drugs. The course first examines social definitions of drugs, conditions of their use, and socialization into drug use. It then con-

siders deviant drug use and effects of social control on definitions and use. A range of licit and illicit drugs will be considered, but major emphasis will be given to alcohol, marijuana, and heroin.

21.142 Sociology of Alcoholism 4 Q.H.

The course focuses on social responses to deviant alcohol use. The course examines, in sequence, drinking cultures and drinking practices in the United States; processes by which people are labeled "alcoholics"; and the role of agencies of social control, such as the criminal justice system and the health care system, in labeling and in rehabilitation.

**21.145 Cities and Society 4 Q.H.
(Formerly Urban Society)**

Topics include the foundations of urban life in historical perspective; relation of city life to environment, population, social organization, technology and cultural values; growth trends, urbanization, urban planning, and citizen action.

21.146 Suburb and Metropolis 4 Q.H.

(Prereq. 21.100 or equiv.)

The course explores ecology of suburban and metropolitan growth, impact on center city and rural fringe, emergent life styles and institutional forms. Compares interdependence, issues of identity, autonomy, and accessibility. Analysis of different types of metropolitan political, social, and economic institutions. Prospects for regional action.

21.150 Race and Ethnic Relations 4 Q.H.

(Prereq. 21.100 or equiv.)

The course focuses on racial and religious groups, particularly with reference to the United States; special emphasis on historical development, specific problems of adjustment and assimilation, and specific present-day problems and trends.

21.151 Sociology of Prejudice 4 Q.H.

(Prereq. 21.100 or permission of instructor)

This course examines factors in the development and maintenance of prejudice and discrimination. Topics include American race relations, anti-Semitism, sex roles, and stereotyping.

21.152 Race and Ethnic Relations: A World Perspective 4 Q.H.

(Formerly Comparative Race/Ethnic Relations)

This course offers a cross-cultural analysis of race and ethnic relations in western and non-western societies. Explanations of race and ethnic relations in terms of contemporary developments, world problems, and ideological conflicts are included.

21.154 Sociology of Mental Health 4 Q.H.

(Prereq. 21.100 or equiv.)

The course provides a survey of sociological perspectives on mental health and mental disorder. Discussions, readings, and presentations explore the social history of mental illness,

epidemiology, cross-cultural perspectives, patients' careers, social institutions of treatment, and policy implications. Areas of convergence between sociological concepts and psychiatry are examined.

21.155 Medical Sociology 4 Q.H.

(Prereq. 21.100 or permission of instructor)

The course provides an examination of the professions, training, institutions, and problems in health care, with an emphasis on those in the United States. Practical issues in the improvement of health care systems are considered.

21.156 Health Care as a Social Issue 4 Q.H.

(Prereq. 21.100 or permission of instructor)

The course explores the social and political dynamics of health care: who benefits from the system and defends it, who works for change, who wins and why. Topics include the social history of health care, occupational politics, community power structure and the health care setting, the planning and delivery of health services to "haves" and "have-nots," and the role of citizens in determining the future of health care through activism, lobbying, legislation, and participation in controlling the system. Case examples will be provided.

21.157 Sociology of Human Service Organizations 4 Q.H.

If human service organizations are to deal with society's problems they must address organizational problems and maximize efficiency and effectiveness. This course examines the principles of informed management and organizational problem solving in a variety of human service settings, including social service agencies, hospitals, government bureaucracies, and schools. Topics include theories of organizational behavior and structure, decision making, leadership, and authority, goal analysis, and work and satisfaction.

21.158 Death and Dying 4 Q.H.

(Prereq. 21.100 or permission of instructor)

The course focuses on the treatment of death and dying, including problems faced by health care professionals, family members, institutions, the funeral industry, and the dying themselves. The course will discuss cross-cultural perspectives, the social distribution of mortality, the changing nature of death, and the ethical problems in determining life and death with particular attention to such issues as abortion, suicide, and ceasing medical intervention.

21.159 Aging and Society 4 Q.H.

The course offers a survey of issues and questions on aging, with special attention to social and economic consequences of the aging process, including retirement and productivity, health care problems, nursing home residences, widower- and widowhood, and the approach of death. Examples relating to aging in other cultures are presented in a search for new an-

swers to social problems of aging in the United States. Students have the opportunity to learn to anticipate, cope with, and even prevent problems of aging that concern self, family, and clients/patients.

21.161 Social Inequality and Communication 4 Q.H.

The course provides an analysis of the ways in which groups and institutions, in both their ritual and everyday activities, communicate the idea of hierarchy and an individual's place in it through face-to-face interaction, formal communication, and the use of space and time. A dramaturgical approach to social organization with special emphasis on status images in the media and the communication of social place by service organizations and professional groups. Includes some content analysis and observational fieldwork.

21.163 Students, Schools, and Society 4 Q.H.

(Prereq. 21.100)

This course emphasizes the role of education in processes of socialization, social mobility, social control, and social change. Do social characteristics (sex, race, class, age, physical status) influence the school experience? Do schools provide opportunity and initiate change, or do they perpetuate the status quo in economic, political, and social life? Who goes to school, where, for how long, and with what result? How does educational advantage or disadvantage get translated into jobs and social status? Students are encouraged to draw on their own experiences to develop paper topics.

21.164 Sociology of Work 4 Q.H.

This course offers a study of the world of work, focusing on the development of occupational cultures, the nature of careers, and the meanings and implications of professionalization. As part of the course, students are encouraged to do a project on an occupation they are considering for a career or one in which they have had practical experience on co-op.

21.165 Sociology of Business/Industry 4 Q.H.

The course focuses on the role of industry in modern society, similarities and dissimilarities among industrial societies, bureaucracy and its alternatives, unions, supervision democracy and manipulation, the worker on the assembly line, sabotage of the organization, and the role of wages and alienation.

21.166 Social Roles in the Business World 4 Q.H.

The course offers an analysis of the social structure of corporate and business life in contemporary America. Case studies from major accounting and/or industrial firms are presented and discussed. The "career line" in the world of business and management will be examined with a special focus on age/sex, racial/ethnic, and class/income barriers.

21.168 Women Working 4 Q.H.

Differences in the labor force experience of men and women workers generally go unrecognized, and the work experience most common to women—household work—is rarely analyzed. This course will cover women's market and non-market activities, their rewards, and their problems. In addition to empirical and theoretical analyses of the work roles of women. Overall, the course will underscore the differences between work experiences of men and women.

21.170 Sociological Perspectives on Consumerism and Consumer Behavior 4 Q.H. (Replaces 21.167)

The course offers an analysis of consumer-oriented issues, including interest groups, needs, values, institutional networks, decision-making processes, and situational impacts. Exploration of systemic benefits and costs of consumer-relevant actions.

21.173 Computers and Society 4 Q.H. (Prereq. Ability to program a computer)

Examines the impact of the computer "revolution" on the conditions of work and life in contemporary society and on legal and theoretical conceptions of human society and consciousness.

21.175 Technology and Society 4 Q.H.

Does society control technology or is technology directing society? Has technology become dehumanized? How valid is the doctrine of technological inevitability? Can the technological "fix" be viewed as a solution to social problems? Is technology itself a social problem? What can be expected of technology assessment? What of the back-to-nature and anti-technology movements today: are they the waves of the future? These are some of the questions and issues that are discussed and analyzed. Students are expected to do considerable independent study and research.

21.176 Science and Society 4 Q.H.

Science has had profound effects on our society, and scientists have seen the ways in which political, economic, and social forces have guided developments in their fields. Issues such as "responsibility" and "autonomy" created by this interdependence will be explored. Emphasis is on the social structures within which science operates and is communicated, and on science as an occupation and profession, as well as a system of thought and set of tools for producing knowledge.

21.180 Sociology of Religion 4 Q.H. (Prereq. 21.100)

The course offers a comparative and analytic treatment of religion as a social institution, focusing on the relations between religious

organizations and other social institutions, with particular emphasis on the American experience. Religion as an agent of social change and stability is included.

21.185 Sociology of the Arts 4 Q.H. (Prereq. 21.200)

The course offers an examination of the relation between the social organization of society and the forms of art produced—the social role of the artist, how the arts are "manufactured" and distributed, the art consumer's relation to art and the artist, social support for the arts. The course deals with a variety of art forms, with emphasis on the performing arts.

21.190 Leisure, Sport, and Society 4 Q.H.

The course provides an analysis of the social origins and functions of leisure activities, with special emphasis on games and sports as forms of leisure. Considerable emphasis is given to cross-cultural and historical analysis as well as to the relation between leisure activities and various social institutions—economy, polity, family, and religion.

21.200, 21.201 Group Behavior I and II 8 Q.H. (Formerly Group Behavior—The Sociological Imagination)

The course explores how individuals interact in groups and how groups interact with each other. The reflexive self, social aspects of language, situational learning, group perspectives, careers, institutions, and worlds.

21.207 Seminar in Social Psychology 4 Q.H.

Focus is on the interaction of psychological and group processes. Students are required to read original theoretical and research monographs in the field. Topics may include prejudice, reference groups, sex roles, conformity, leadership, aggression, communication, collective behavior, and achievement.

21.215 Collective Behavior 4 Q.H.

Topics include the rise of new group forms in response to persistent social unrest; study of masses, crowds, and publics; analysis of specific instances of collective behavior such as race riots, wildcat strikes, prison revolts, and campus disorders.

21.217 Mass Communication and Public Opinion 4 Q.H.

Topics include factors in the formation and development of public opinion, the effect of television on children, mass communication as social organization, media-depicted images of society, the role of personal influence, the process of rumor, the use of mass media by the poor, propaganda analysis, and the latent and manifest functions of mass communication.

21.218 American Demographics 4 Q.H.

This course is essentially an applied research experience in which students have the opportunity to study the major areas of demography.

The focus of the course is on the resources of the U.S. Census Bureau and, in particular, the data products available from recent census surveys.

21.221 Seminar in Social Welfare 4 Q.H.

Discussion of problems in social welfare observed in the term between "Problems" and "Practicum." A research paper, based on directed fieldwork in the intervening term, is the major course requirement.

21.231 Sociological Theories of Crime 4 Q.H.

The course explores patterns and social forces involved in criminal behavior. Analysis of sociological theories of criminality and comparison of these with other explanations of crime.

21.236 Applied Sociology: Practice and Theory 4 Q.H.

The course provides an analysis of the conditions under which sociological knowledge is applied to social problems, the kinds of problems, and the degree of effectiveness of this application. Particular attention is paid to research and demonstration projects that derive from sociological theory.

21.237 Social Deviance II 4 Q.H.

The course offers an examination of the leading theories of deviance (anomie, subcultural deviance, labeling) and their principal variants; study of their assumptions, conceptions, propositions, and supportive evidence; analysis of empirical studies in each theoretical tradition.

21.238 Social Policy and Social Intervention (Formerly Social Control II) 4 Q.H.

The course focuses on study of the formation of social policies in response to social problems, analysis of policies and problems, supporters and opponents of policy change, conditions under which control agencies adopt new policies, and effects of policy change. Particular emphasis on case studies of social action and legal change.

21.239 Introduction to Statistical Analysis 4 Q.H.

(Prereq. 21.100 or permission of instructor) This course examines the application to social data of the principles of measurement, probability, measures of centrality, tests of significance, and techniques of association and correlation.

21.240 Research Methods I 4 Q.H.

(Prereq. 21.100 and 21.239, or permission of instructor)

This course introduces students to the research process through an examination of the rules of evidence in empirical research and the place of values. Students have the opportunity to learn how to design and critique types of sociological research, how to collect qualitative and quantitative data, and how to sample populations.

21.241 Research Methods II 4 Q.H.

(Prereq. 21.100, 21.239, and 21.240, or permission of instructor)

Students are required to complete the research project begun in Research Methods I; practice coding, building indexes, scaling, table construction; introduction to use of the computer.

21.242 Qualitative Research Methods 4 Q.H.

The course offers an introduction to sociological fieldwork—methods of gathering data by extended observation of and interaction with people in natural settings. Students will take part in a series of observations designed to teach the basic skills of open-ended interviewing, observing, recording, and analyzing data. The theoretical base will be symbolic interaction.

21.243 Human Services Research and Evaluation 4 Q.H.

(Prereq. 21.239 or other statistics, 21.157, or permission of instructor)

This course covers basic issues in applied research and the evaluation of services, including attention to the purposes of evaluation, ethics, formulating questions and measuring answers, designing evaluations and planning oriented research, utilizing evaluation results, and the turbulent setting of action programs. Suitable for students majoring in human services, sociology, psychology, nursing, health education, and related fields.

21.245 Community Analysis 4 Q.H.

(Prereq. Permission of instructor or three sociology/anthropology courses)

This course explores types of human settlements, focusing on the interaction between people and their political, economic, and social environments. Topics include power structure and citizen action to influence institutions; skills in community analysis, including use of documents, survey, observation, and evaluation of needs and resources; strategies of conflict, cooperation, and negotiation to attain community and group ends.

21.246 Seminar in Urban Studies 4 Q.H.

(Prereq. 21.145 or permission of instructor)

Interdisciplinary approaches to urban studies are compared according to problem areas and research methods. Students have the opportunity to extend previous term paper projects after exposure to social action and social systemic theoretical perspectives.

21.250 Political Sociology: Who Gets What 4 Q.H.

(Prereq. Permission of instructor or four sociology/anthropology courses)

This course offers an examination of formal political structures and informal quasi-political groups. Topics include sociological analysis of ideology, class politics, mass movements, and

the conflict of various social and economic groups as they vie for political power and influence.

21.255 Administration and Formal Organizations: People, Machines, and Bureaucracies 4 Q.H.
(Formerly Sociology of Formal Organizations)

The course focuses on principles of formal organization. Topics include theories of bureaucracy and concept of authority; communication systems and other conceptions of formal organization. Structure of work groups and their effect on the larger organization. The social content of organizations.

21.256 Comparative Human Services I 6 Q.H.

This course offers an intensive look at the American human services system. The course is designed to afford upper-level undergraduate and graduate students the opportunity to study the origins, development, and present state of human services in the United States. The course involves lectures as well as field visits in the Boston area. In addition to the normal classroom activities, independent study is provided.

21.257 Comparative Human Services II 6 Q.H.

This course offers an intensive study of the British human services system. This course provides students the opportunity to immerse themselves in the social and cultural context of British human services and involves field trips in London designed to examine firsthand the planning, administration, and delivery of human services in Great Britain.

21.260 Social Stratification: Class, Status, and Power 4 Q.H.

(Prereq. Permission of instructor or four sociology/anthropology courses)
Topics include theories of social inequality, concepts of social class, aspects of status and role difference, criteria for social mobility.

21.265 Sociology of Occupations and Professions 4 Q.H.

(Prereq. Permission of instructor or four sociology/anthropology courses)
Topics include the meanings of work; division of labor and specialization; analysis of occupational structure and patterns of recruitment, training, and career preferences; the classic professions and new trends in professionalization.

21.270 Class, Power, and Social Change 4 Q.H.

(Prereq. 21.200 and junior or senior standing in sociology/anthropology or permission of instructor)

The course focuses on theories of social equality and inequality as applied to the exercise of power and the growth and development of social movements and group conflict as seen from the point of view of large-scale social change. *Required of majors.*

21.280 Classical Social Thought 4 Q.H.

(Prereq. Three sociology/anthropology courses)
The course examines the development of sociology from the history of social thought. The emergence of several schools, beginning with positivistic organicism and conflict theory.

21.281 Current Social Thought 4 Q.H.

(Prereq. Three sociology/anthropology courses)
A seminar-lecture course in which formalism, social behaviorism, social action theory, and functionalism are studied critically.

21.282 Feminist Perspectives on Society 4 Q.H.

(Prereq. 93.131 or equiv., or permission of instructor)

This course examines a sampling of the burgeoning feminist literature in the social sciences and in theory, focusing on at least three major tendencies in this literature: radical feminism, socialist feminism, and neo-Freudian feminism. Specific topics include the origins and/or universality of women's oppression; women's work under capitalism; socialism and women's liberation; and family structure and the reproduction of gender.

21.287 Senior Seminar 4 Q.H.

(Prereq. Senior standing in sociology/anthropology or permission of Instructor)
The course provides the opportunity to analyze, from sociological perspectives, student experience in work and voluntary service and to develop and extend research interests related to that work or action experience.

21.288, 21.289, 21.290, 21.291
Directed Study (each) 4 Q.H.

(Prereq. Junior or senior standing in sociology or permission of instructor)
The course offers independent work on a chosen topic under the direction of members of the Department. Limited to qualified students with approval of department chairperson.

21.292 Seminar In Current Emphases In Sociology: Writing and Talking 4 Q.H.

(Prereq. Junior or senior standing in sociology/anthropology or permission of instructor)
The class considers prevailing modes of presentation in major journals and verbal presentation in teaching, consulting, etc. Class members are required to submit examples of their own writing for analysis.

21.293 Seminar In Current Emphases In Sociology 4 Q.H.

(Prereq. Junior or senior standing in sociology/anthropology or permission of instructor)
This course offers review and discussion of selected sociological topics.

21.295, 21.296, 21.297, 21.298 Junior-Senior Honors Program (each) 4 Q.H.

For prerequisites and other details, see the section on the Junior-Senior Honors Program on page 5.

93.120 An Analysis of American Racism 4 Q.H.
This is a seminar in contemporary aspects of racism in America. The cycle of racism in our institutions helping to form our attitudes and of our attitudes, in turn, shaping our institutions is studied and discussed. Emphasis is on the practical, day-to-day aspects of racism, rather than the theoretical and historical.

93.130 Professional Practices: Individual and Social Dimensions. 4 Q.H.
The course explores the dimensions and dilemmas of freedom and responsibility confronting professional people practicing within limits set by socio-economic conditions, by clients, and by other professionals. Case histories are examined to illustrate the dilemmas professionals face, the choices that are typically made, and the consequences these have on the freedom of the practitioner, and on personal and professional integrity.

93.131 Introduction to Women Studies: Image, Myth, and Reality 4 Q.H.
This is an introductory course in the study of women in society, encompassing the historical, political, economic, and social processes that have created both the image and the reality of women in contemporary society. The course offers an overview of the many different disciplinary approaches to the study of women.

93.204 Health Professions: Past, Present, and Future 4 Q.H.
This course focuses on social history of the modern health professions. The course explores long-range patterns in the organization and regulation of the health professions, beginning with the Middle Ages and emphasizing the Jacksonian period, industrialization, modern professional organizations, the growing role of the state, responses of the health professions, and the future of health care in the United States under various corporate/government schemes for reorganization and "accountability."

Political Science

22.110 Introduction to Politics 4 Q.H.
This course offers a broad-based introduction to contemporary political science. Areas covered include a consideration of basic concepts in political analysis (e.g., power, authority, and sovereignty); the role of governmental institutions in the making of public policy; public opinion and processes of political representation; contemporary political ideologies; and the scope and methods of political science.

22.111 Introduction to American Government 4 Q.H.
The course provides an analysis of the American governmental and political processes by focusing on constitutionalism, liberties, institutions, and political behavior.

22.112 Introduction to International Relations 4 Q.H.
The course focuses on elements of international relations, including sovereign power, and limitations on the behavior of nation-states. International law, diplomacy, the politics of international economic relations, and contemporary problems in international relations—peace and war, the arms race, detente, human rights, technology, population, and neo-imperialism will be covered.

22.113 Introduction to Foreign Governments and Societies 4 Q.H.
(Formerly Introduction to Comparative Government)
The course offers a comparative study of parliamentary democracy in Western Europe;

Communist totalitarianism in the Soviet Union, China, and Eastern Europe; and variations of these governmental systems in the "third world" countries of Asia, Africa, and the Middle East.

22.120 Conceptual Foundations of Contemporary Political Analyses 4 Q.H.
The course provides an introduction to the conceptual problems associated with the study of politics, including scientific method and a general overview of various methodological perspectives (i.e., systems theory, game theory, and survey analysis) as practiced by contemporary political scientists.

22.121 Research Methods I 4 Q.H.
The course offers an introduction to the principal quantitative methods used in political analysis, public administration, political behavior, international relations, and policy sciences. Emphasis is on basic statistical techniques, survey methods, and SPSS programming.

22.122 Research Methods II 4 Q.H.
(Prereq. 22.121)

This is an intermediate course in quantitative analytic techniques with emphasis on practical problem solving in areas of concentration, particularly political behavior, policy sciences, public administration, and international relations. Includes intermediate statistical techniques such as multivariate analysis and casual modelling, using SPSS and drawing upon machine-readable data.

22.129 Politics and Violence in**Northern Ireland****4 Q.H.**

This course will analyze the causes of violence in Northern Ireland. Although historical, sociological, and economic roots of the conflict will be considered, the major focus will be on politics. The international dimension (the roles of southern Ireland, the U.S., etc.), paramilitary organizations, legal political parties and groups, and potential solutions will be discussed. Comparative parallels will be drawn, including possible lessons for the U.S.

22.130 Politics and the Mass Media**4 Q.H.**

This course analyzes several facets of the mass media: the role of newspapers, radio, and television in public opinion formation; their use and effectiveness in political campaigns; their objectivity and/or bias in reporting the news; their impact on political parties and the distribution of power between Congress and the President.

22.132 Political Behavior**4 Q.H.**

(Prereq. 22.110)

This course examines selected topics in contemporary political science from a political behavior perspective. Topics include political attitude formation and change, ideology, socialization, public opinion and voting behavior, political campaigning, political violence, and empirical democratic theory.

22.133 Political Parties and**Pressure Groups****4 Q.H.**

An analysis of political parties and pressure groups in the American political system, with attention given to policy making, elections, voting behavior, and state and national political trends.

22.134 The American Presidency**4 Q.H.**

(Prereq. 22.111)

The course provides a behavioral examination of the nation's chief executive. The presidential electoral process, the president's many constituencies, and the differing styles of various twentieth-century presidents are considered. The constitutional and extra-constitutional powers of the office, presidential relations to Congress, the bureaucracy, and the judicial process.

22.135 American Constitutional Law**4 Q.H.**

(Prereq. 22.111 and junior or senior status)

Employing excerpts of United States Supreme Court decisions and other reading materials, this course attempts an analysis of some of the theoretical, structural, and substantive issues inherent in and relevant to the American constitutional system.

22.136 American Legislative Process**4 Q.H.**

(Prereq. 22.111)

This course offers a study of American national legislative structure, function, and behavior

22.137 Civil Liberties**4 Q.H.**

(Prereq. 22.136 and junior or senior status))

Employing United States Supreme Court decisions and other reading material, this course examines the substantive and procedural guarantees of the Bill of Rights and the Fourteenth Amendment and their relation to a liberal democratic society.

22.139 American Ideology**4 Q.H.**

This course offers an analysis of racism, nationalism, liberalism, and capitalism—four of the most profound American ideologies—from a behavioral perspective. Topics include examination of the historic roots of each, their impact on the electoral and legislative processes, and the attempts to accommodate the contradiction of each in the contemporary American political experience. An attempt to understand the ongoing interaction of political ideology and the political process in American society.

22.141 State and Local Government**4 Q.H.**

(Prereq. 22.111)

This course introduces students to the political and administrative context of state and local government and surveys the structure, function, and politics of states and localities within the context of the United States Federal system. (Public Administration elective)

22.143 Urban Politics**4 Q.H.**

The course provides an analysis of the political, administrative, economic, and social dynamics of urban areas from a historical perspective. (Public Administration elective)

22.144 Housing and Community**Development****4 Q.H.**

The course offers a review of historical metropolitan growth patterns and the influence of public policy on the development of American cities. Topics such as urban renewal, suburbanization of low- and moderate-income housing, and new communities are discussed. (Public Administration elective)

22.146 Practical Politics**4 Q.H.**

(Prereq. 22.111)

This course is designed to accentuate and systematically treat some of the problems of organizing for effective citizen action, partisan and nonpartisan, at the grass-roots level. An exploration of roles in political campaigning.

22.148 Sex Roles in American Politics**4 Q.H.**

The course explores the relation between what is and what ought to be—and why—in the roles of women in American politics. Topics include the traditional roles of women in politics, the suffrage movement, the woman as citizen and voter, the role of sex in achieving power and in political efficacy, and the place of women in "new politics." Political action to promote women's issues and modern feminism will also be covered.

22.153 European Parliamentary Systems 4 Q.H.
(Prereq. 22.113)

The course offers a comparative analysis of political culture, federal and unitary forms of government, and executive-legislative relations on the national level in England, France, and West Germany.

22.154 Arab-Israeli Conflict 4 Q.H.

The Arab-Israeli confrontation has its own dynamics, and its nature has changed through the decades. This course analyzes its interaction with the internal politics of the Arab states and Israel, Pan-Arab politics, and the role of the great powers in the region.

22.155 European Political Parties 4 Q.H.
(Prereq. 22.113)

The focus of this course is on political party organization and voter behavior in England, France, and Germany, with emphasis on party ideologies, strategies, campaigns, and elections, as well as socialization, recruitment, and participation of voters in the political process.

22.160 The Politics of Poverty 4 Q.H.

This course is concerned with what is referred to as the poverty system: how and why there is poverty, how it affects people's lives, and how it can be eliminated. As a discussion-centered course, relying also on simulations, small group work, and experience-based learning, it examines the relations between poverty, racism, and the economic, political, and administrative systems. A number of alternatives will be evaluated and an opportunity provided for clarifying individual assumptions and feelings about poverty.

22.167 Techniques and Practices of Public Management 4 Q.H.
(Prereq. 22.261)

This course is oriented toward practical skills and techniques of public management and employs the case method in examining typical management problems at different levels of government. Time and resource management for public sector managerial personnel is also covered.

22.168 Human Services Administration 4 Q.H.

The ways in which human services are provided by the political, economic, and bureaucratic systems to low-income citizens are studied. The course is designed to help students develop knowledge of the public policy process, human services organizations, and delivery systems, and awareness of their values and potential as human services professionals. A discussion-based course for students interested in human services. (Public Administration elective)

22.171 Law and Society 4 Q.H.
(Prereq. Open only to upperclass, non-political science majors.)

This course examines the theory and practice of the American legal process and its impact on

values. Also an analysis of the impact on these values of the military-industrial-technological complex.

22.173 Politics and Economic Problems 4 Q.H.
(Prereq. 22.111 or 22.177)

The course offers a survey of the relation between economic developments and political processes in the United States. Among the topics considered are government planning of the economy, monopoly and government regulation, government programs to promote social welfare, and the impact of Federalism on the political-economic system.

22.175 Current Political Issues 4 Q.H.

The course provides an analysis of the constitutional and political background of selected contemporary public issues. Primarily for non-political science majors.

22.177 American Political Process 4 Q.H.

The course offers a general analysis of the American political system with emphasis on the topic of civil liberties. Not open to political science majors or anyone who has taken 22.111, Introduction to American Government.

22.178 The Politics of the Criminal Justice System 4 Q.H.
(Prereq. 22.111 or 22.177)

This course focuses on the criminal justice system from arrest by police to appeal to the Supreme Court of the United States. The roles of police, lawyers, judges, prosecutors, juries, and correction officers are examined.

22.179 World Politics 4 Q.H.

The course examines political continuum and change in the international system by observing both traditional actors, such as nation-state, and modern actors, such as multinational corporations, in relation to their goals and the means each uses to attain them. Primarily for non-political science majors; not open to anyone who has taken 22.112, Introduction to International Relations.

22.183 Comparative Public Administration 4 Q.H.

The course provides a comparative study of the approaches to public administration in selected democratic governments in the United States and Europe.

22.219 Eurocommunism 4 Q.H.

This course presents a study of the domestic and foreign policies of the Spanish, French, and Italian communist parties with special attention to their relations with the international communist movement.

22.220 The Politics of Imperialism 4 Q.H.
(Prereq. 22.112)

The course focuses on the political dynamics of penetration of foreign economies and foreign politics, considering such elements as military intervention, foreign aid, and the impact of the multinational corporations.

22.223 American Foreign Policy 4 Q.H.

The course examines formulation and conduct of foreign policy; role of the United States in politics since 1945.

22.225 Soviet Government 4 Q.H.

(Prereq. 22.113)

The course offers a study of Soviet political origins and behavior, with emphasis on recent changes in the party and state apparatus, the economy, and the administration of justice.

22.226 Soviet Foreign Policy 4 Q.H.

The course focuses on the evolution of Soviet foreign policy since 1917, with emphasis on the development of the international Communist movement and the onset of the East-West ideological conflict.

22.227 Communism in Eastern Europe 4 Q.H.

(Prereq. 22.113)

The course focuses on the communist governments of Eastern Europe, with emphasis on their growing independence from Soviet Russia. Recent political change, economic liberalization, and new orientation in foreign policy.

22.228 Government and Politics in Africa 4 Q.H.

(Prereq. 22.113)

Topics include the governmental systems, political parties, socioeconomic problems, and foreign policies of selected states north and south of the Sahara.

22.231 International Organization 4 Q.H.

(Prereq. 22.112)

The course focuses on development of international organizations with special emphasis on the United Nations system. (Public Administration elective)

22.232 Political Polling and**Survey Research 4 Q.H.**

(Prereq. 22.121)

Survey research is the most common approach to program evaluation. This course involves an examination of the entire survey research process, including survey design, sampling, questionnaire design, survey administration, data processing, and data analysis. Some statistical analysis will also be involved.

22.233 International Law 4 Q.H.

(Prereq. 22.112)

Topics include territory and jurisdiction of states, treaties, recognition, peaceful settlement of disputes, resort to force.

22.235 Law and Personal Morality 4 Q.H.

An examination of the use of political power to enforce standards of personal morality and behavior in contemporary American society. Subjects considered will include pornography, sexual privacy and expression, Sunday closing laws, abortion, and prostitution.

22.236 Women in Public Management 4 Q.H.

Examination of the challenges and problems commonly experienced by female managers

working in complex, public sector organizations. Emphasis will be placed on strategies for alleviating such problems. Special attention will be focused on career development for women in managerial roles.

22.238 Ethnic Conflict in International Perspective 4 Q.H.

The course offers a comparative study of ethnic conflict, with its religious, linguistic, racial, and economic roots in such places as Nigeria, Cyprus, Canada, Northern Ireland, Belgium, and the United States. World order implications and Great Power consequences of such confrontations will also be studied.

22.240 Totalitarianism and Dictatorship 4 Q.H.

(Prereq. 22.113)

The course presents an analysis of totalitarianism, dictatorship, and autocracy, including study of historical background, characteristics, theories of origin, nature, and significance; evaluation of techniques, ideologies (e.g., Marxism-Leninism), policies, and institutions. Particular attention is given to Soviet and German experiences.

22.242 The Politics of Revolution and Change

(Prereq. 22.113)

The course offers an analysis of revolution and change, contemporary and historical, with attention to both theory and practice. Topics discussed include major trends in contemporary politics and society, and the relation between political change and technological, scientific, or social change.

22.243 Government and Politics of China 4 Q.H.

Topics include government and party organization, socio-economic problems and policies. Concentration on the influence of history, technology, and ideology as determinants of attitudes and behavior.

22.244 China's Foreign Relations 4 Q.H.

The course examines China's traditional view of international relations and its modification first by contact with the West and later by Marxism-Leninism. The course investigates China's role in changing the international system to accord more with its perspectives on sovereignty and equality and the principles of socialist internationalism.

22.245 The Politics and Policies of Developing Nations 4 Q.H.

The course presents a survey of recent political and related change among third-world countries of Africa, Latin America, and Asia. Topics included are the heritage of colonialism and achievement of independence, the realities of cultural pluralism, revolution and political violence, institution building, political leadership and role of ideology, political parties, the military in politics, and the international aspects of political modernization.

22.247 Government and Politics of Latin America**4 Q.H.**

The governmental systems, political parties, socioeconomic problems, and foreign policies of Latin American states. Focus will be on political change.

22.250 Government and Politics of Japan**4 Q.H.**

(Prereq. 22.112 or 22.113)

Examines Japan's political development from the Meiji Restoration to the present, exploring the unique form of democratic government practiced in Japan and evaluating the effects of Japanese political theory, war, the American occupation, the Emperor, and Japanese political and cultural values on Japan's political institutions. Japan's present and future impact on the international system is also considered.

22.257 Government and Politics in the Middle East**4 Q.H.**

Approaches the political, economic, military, and ideological factors within the Arab states and Israel, inter-Arab politics, the Arab-Israeli conflict, and the great power rivalry in the region.

22.259 Political Development in Revolutionary Societies**4 Q.H.**

(Prereq. 22.112 or 22.113)

Examination of political development in selected revolutionary societies, including Cuba.

22.260 Public Policy Analysis**4 Q.H.**

An analysis and evaluation of public policy in the United States.

22.261 Public Administration**4 Q.H.**

(Prereq. 22.111)

Introduction to the theory and practice of public administration, with special emphasis on the generalities of institutions, processes, and behavior of bureaucratic organizations.

22.262 Organization Theory**4 Q.H.**

Provides a broad overview of organization theories, their history, and development. Specific attention is given to developing a paradigm for public organizations that focuses on the relations of economic, democratic, bureaucratic, technological, and humanistic imperatives. The student will prepare a research paper and consider the implications of this paradigm for future organizations.

22.263 Public Management**4 Q.H.**

(Prereq. 22.261)

What problems are entailed in the management of public agencies? How do public managers seek to solve these problems? These questions are explored through the use of descriptive, analytical, and case materials. (Public Administration elective)

22.266 Public Personnel Administration**4 Q.H.**

(Prereq. 22.261)

Designed to be an overall introduction to the field of public personnel administration. It in-

cludes examination of selected topics such as recruitment, selection, classification, care development, equal opportunity, public employee unionism, and collective bargaining.

22.267 Public Budgeting**4 Q.H.**

(Prereq. 22.261)

Focuses on the function of budgeting in a variety of governmental contexts, specifically the appropriations process, the budget as a management tool, and the public policy impacts of the budget. Budgeting techniques are emphasized within this context.

22.269 Governmental Accounting**4 Q.H.**

(Prereq. 22.261)

Basic accounting principles and methods used by government agencies, including the utilization and interpretation of financial statements, auditing, and the application of electronic data processing in government record keeping. (Public Administration elective)

22.270 Political Theory**4 Q.H.**

(Prereq. Junior or senior status or permission of instructor)

An analytic approach to the study of key political concepts: power, equality, freedom, authority, obligation, ethics, law, rights, punishment, state, sovereignty.

22.273 Political Thought I**4 Q.H.**

(Prereq. Junior status or permission of instructor)

An analytical and historical examination of the great political thinkers and the main trends of political thought from the Grecian age to the Renaissance.

22.274 Political Thought II**4 Q.H.**

(Prereq. 22.273)

An analytical and historical examination of the great political thinkers and the main trends in political thought from the Renaissance to the twentieth century.

22.276 American Political Thought**4 Q.H.**

The contributions to political theory of the main social, economic, political, intellectual, and philosophic movements in America from the colonial period to the present.

22.278 Contemporary Political Thought**4 Q.H.**

Analysis of current ideals, ideologies, and political movements, including existentialism, neo-Marxism, black power, women's liberation. The decline of ideology and behavioralism.

22.282 Seminar in American Government**4 Q.H.**

(Prereq. Senior political science major and permission of instructor)

An in-depth study of selected topics in American government.

22.283 Seminar in International Relations**4 Q.H.**

(Prereq. Senior political science major and permission of instructor)

This course offers an in-depth study of selected topics in international relations.

22.284 Seminar In Comparative Politics 4 Q.H.
(Prereq. Senior political science major and permission of instructor)

This course offers an in-depth study of selected topics in comparative politics.

22.285 Senior Seminar In Political Science 4 Q.H.
(Prereq. Senior political science major)

This course offers an in-depth study of selected topics in political science.

22.286 Research Seminar In Political Science 4 Q.H.

This course focuses on the preparation of a research paper.

22.288 Seminar In Public Law and Social Issues 4 Q.H.
(Prereq. Junior or senior status and permission of instructor)

This course examines some of the continuing

and perplexing social problems through the media of legal writings and recent court cases. Issues to be discussed include abortion, euthanasia, family planning, criticism of public officials, political activism, the right of privacy, obscenity, racial and economic discrimination.

22.290, 22.291, 22.292 Directed Study (each) 4 Q.H.

This course offers independent work on chosen topics under the direction of members of the Department and is limited to qualified juniors and seniors with approval of instructor.

22.295, 22.296, 22.297, 22.298 Junior-Senior Honors Program (each) 4 Q.H.

For prerequisites and other details, see the section on the Junior-Senior Honors Program on page 5.

History

23.101 Western Civilization 4 Q.H.

This course explores the major ideas and institutions of Western Civilization from ancient times to 1648.

23.102 Western Civilization 4 Q.H.

A continuation of 23.101, covering the period since 1648.

23.108 Hitler's Germany (Group B) 4 Q.H.

This course offers a study of the origins and nature of Hitler's Third Reich, emphasizing the personal lives of Nazi leaders in an attempt to understand how seemingly ordinary people could enthusiastically promote wars of aggression and revel in genocidal policies.

23.109 Population In European History (Group A or B) 4 Q.H.

This course provides an application of the principles of demography to European history from Roman times to the present, with attention to the interaction of birth, death, marriage, and migration rates with climate change, epidemic disease, war, economic developments, social upheaval, and political policy.

23.111 Ancient Greece (Group A) 4 Q.H.

Topics include the origins and development of Greek civilization; political evolution of Hellenic society from tribal to city-state organization; growth and application of Greek religious, political, and ethical ideas.

23.112 Ancient Rome (Group A) 4 Q.H.

This course examines Roman civilization in two sequences: 1) the rise of Roman power under the Republic and 2) the decline of Roman power under the Empire.

23.115 Medieval Europe (Group A) 4 Q.H.

Topics include Europe from the barbarian invasions to the late thirteenth century; the expansion of Christianity and the institutionalization

of church and papacy; the emergence of the Holy Roman Empire, England, and France as political units; social, cultural, and economic developments.

23.116 Europe In the Age of the Renaissance (Group A) 4 Q.H.

The course focuses on Europe from 1300 to 1500, when alternatives to medieval institutions became increasingly apparent. Special attention to political, economic, and cultural changes in Italy and northern Europe.

23.122 Europe, 1870-1921 (Group B) 4 Q.H.

The course focuses on Europe from the Franco-Prussian War to the post-World War I settlement: the growing tensions and rivalries and the declining certainties of the end of the nineteenth century, the origins of World War I, the War itself, the Russian Revolution, and the Peace of Paris.

23.123 Europe since 1921 (Group B) 4 Q.H.

The course focuses on Europe from the Versailles Settlement: the rise of totalitarianism, the Depression, the crises of liberalism and of the European mind, the Appeasement Era, World War II, the Cold War, the end of colonialism, and Europe today.

23.127 The French Revolution and Napoleon (Group B) 4 Q.H.

The course examines the history of France in the age of the *ancien regime* and the Enlightenment as background for the French Revolution and Napoleon.

23.130 England to 1688 (Group A) 4 Q.H.

Topics include prehistoric Britain, the Anglo-Saxons, the Normans, the Plantagenets, the Tudors, and the Stuarts, with emphasis on the development of parliamentary institutions until the Glorious Revolution.

23.131 England since 1688 (Group B) 4 Q.H.

The course focuses on England from the Glorious Revolution to the present, with emphasis on the development of Parliament, the Industrial Revolution, nineteenth-century reaction and reform, the World Wars, and the rise of socialism.

23.134 Tudor England (Group A) 4 Q.H.

This course offers a study of England from the late fifteenth to the early seventeenth century. Topics include an examination of the Tudor contribution to the development of political and social institutions; the Protestant Reformation and the relation between religion and politics; social and economic changes and their relation to the Elizabethan Renaissance. Particular emphasis is placed on intellectual and cultural developments and England's relation to Europe and the New World.

23.135 Victorian England (Group B) 4 Q.H.

The economic, social, and political life of the English people during Victoria's reign.

23.137 The Decline of Great Britain

(Group B) 4 Q.H.

The economic, social, and political life of the English people in the twentieth century.

23.138 Irish Civilization (Group B) 4 Q.H.

The course examines the history of Irish civilization from the earliest hero sagas and their impact on Irish values to the Irish independence movement, the prototype and model for many other twentieth-century liberation movements.

23.139 History of Modern Italy (Group B) 4 Q.H.

The course offers a survey of the social, economic, and political development of the modern Italian state from the seventeenth century to the present. Emphasis on the problem of modernization.

23.140 Imperial Russia (Group B) 4 Q.H.

The course focuses on the emergence of Russia as a recognized European power, westernization and expansion in the eighteenth century, the impact of Napoleon, reform and revolution.

23.141 Soviet Russia (Group B) 4 Q.H.

The course examines forces molding the history of Russia since 1917, internal developments, and foreign relations.

23.142 Islam Resurgent (Group D) 4 Q.H.

An analysis of what has been called "the militant revival of Islam" as a rallying point for reformist or revolutionary movements in the Muslim world. The course will include little-known Muslim areas outside the Middle East in Africa and Asia.

23.145 The Modern Middle East (Group D) 4 Q.H.

Focus of this course is on the Middle East since 1800, with emphasis on the background of present problems.

23.146 Contemporary Middle East

(Group D) 4 Q.H.

The course focuses on political, economic, and

social developments in the Middle East since the end of World War II.

23.149 Imperialism (Group B) 4 Q.H.

The course examines the rise and fall of the European colonial empires with an emphasis on the period of the late eighteenth to the twentieth century. Attention is given to theories underlying imperial expansion and the impact of imperialism on colonies and colonizers.

23.157 The Middle East Today In Fact, Fiction, and Film (Group D) 4 Q.H.

A study of social, economic, and political changes and conflict in the lives of ordinary people who have been experiencing the recent crises reported in the media. The course will focus on common experiences among various peoples—Turks, Armenians, Israelis, Arabs, and Iranians—and will emphasize significant themes: lifestyles, generational conflict, the changing role of women, ethnic or ideological conflict, and the prevalence of identity crises attending cultural and social disruption.

23.160 History of Science and Technology

(Group A or B) 4 Q.H.

The course offers an interdisciplinary survey of the development of science and technology, integrating theories of the philosophy and sociology of science within a historical framework. Emphasis is placed on the environmental and ideological conditions that contribute to the birth and growth of the various sciences and to the relation between these conditions and technological innovation.

23.162 Technological Transformations

of Society (Groups B, C, D) 4 Q.H.

The relation between technological innovations and the world in which they take place. Discussion of conditions necessary for discovery and innovation. Impact of technology on political, economic, and social environments.

23.163 Capitalists and Capitalism

(Group B or C) 4 Q.H.

This course provides an examination of capitalism from the Renaissance to the present with attention to the role of major individual capitalists like the Rothschilds, Krupps, and Rockefellers, and to the impact of great historical forces like war, the Protestant Reformation, and imperialism.

23.165 The Family in European History

(Group B) 4 Q.H.

The course offers an examination of issues in the history of the European family from the late Middle Ages to the present. Topics include marriage and sexuality, child-rearing practices, the effect of industrialization and revolution on family life, the Victorian family, and the evolution of the modern family. Students will prepare their own family histories.

23.166 The Culture of Europe (Group B) 4 Q.H.
(Formerly The Creative Matrix)

The course provides an analysis of the culture of the West in the nineteenth and twentieth centuries, focusing on the conjunction of social, cultural, and psychological forces that encouraged or retarded creativity. Attempts will be made to show the interconnections among the arts, social sciences, and sciences within each of the periods covered.

23.168 Class, Love, and Power in Western Europe (Group B) 4 Q.H.

The course provides an examination of social change in Europe since 1800 with emphasis on the interaction of industrialization, class movements, demographic trends, and revolutionary upheavals.

23.172 Recent Leaders of Asia (Group D) 4 Q.H.

The course focuses on the lives and roles of recent leaders of Japan, China, India, and other Asiatic countries.

23.173 China since 1850 (Group D) 4 Q.H.

The course focuses on the history of China from the Opium War to the present, with emphasis on the concepts and policies of the Communist regime since 1949.

23.174 Japan since 1850 (Group D) 4 Q.H.

The course examines the history of Japan since its opening by the West. Emphasis on westernization, the rise of Japan as a world power, and the Japanese experience since the defeat in World War II.

23.175 Communist China (Group D) 4 Q.H.

Focus of this course is a close look at the policies and achievements of China since the communists won control in 1949. The major emphasis is upon the background for communist victory, the unique vision of Mao Zedong and his prescriptions for China, and the radical changes since Mao's death and the arrest of the "Gang of Four."

23.178 Health and Sickness: Historical Perspectives (Group A, B, C, or D) 4 Q.H.

A survey of medical theories and the health care systems derived from them, from ancient times to the present. Medical theory and practice as related both to the general history of the time and to the particular political, economic, or social circumstances that influenced institutions for health care.

23.179 Protesters, Prisoners, and Professionals: The History of Female Deviance and Its Punishment (Group A, B, or C) 4 Q.H.

The course identifies concepts of female deviance from the early Christian era to the present, analyzing these concepts in the social contexts in which they were generated and

examining varying reactions to deviant females over time. Specific topics include witchcraft, sexual deviations, infanticide, property crime, and violent crime. The course is divided into four main sections: (1) femaleness as deviance: historical overview; (2) unruly women; (3) women, violence, victimization; and (4) the punishment of female deviants by the contemporary criminal justice system.

23.182 Modern European Economic History (Group B) 4 Q.H.

The course provides a survey of the development of the Western world examined within the framework of economic theory, with attention to social and political ramifications.

23.184 Communism and Revolution (Group B) 4 Q.H.

The course focuses on the history of socialism and revolution from the early nineteenth-century utopias to the New Left of the 1960s.

23.185 Revolutions (Group A or B) 4 Q.H.

This course provides a review of the important theories of revolution and an analysis of the major early modern and modern revolutions, with a view to evolving a working theory of both political and generational revolutions for the twentieth century.

23.186 War in the Twentieth Century (Group B, C, or D) 4 Q.H.

The course provides an analysis of the causes, prosecutions, and effects of the major wars fought in the twentieth century. The course concentrates on the First and Second World Wars and on the Vietnam War. Using film, simulations, and other materials, classes explore the economic, social, cultural, and psychological impacts of these wars as well as their political, diplomatic, and material aspects.

23.188 History and Film (Group B or C) 4 Q.H.*

The course offers an exploration of various historical issues as seen through the eyes of historians and filmmakers. Both acted and documentary films are shown in combination with readings from a variety of source and interpretive materials.

23.189 Oral History (Group C) 4 Q.H.

This course focuses on the value of learning history from those who lived it. Students are expected to conduct tape-recorded interviews with people who can tell them about a selected aspect of twentieth-century history from firsthand experience.

23.195 Advanced Western Civilization 4 Q.H.
(Prereq. Invitation of instructor of 23.101)

Students who demonstrate mastery of 23.101 through consistently superior work may be invited to work on an individual basis with their instructor. Together they will work out projects relating to the course.

23.196 Advanced Western Civilization 4 Q.H.
(Prereq. Invitation of Instructor of 23.102)
Similar to 23.195 in relation to 23.102.

23.197 Women In European History to 1815 (Group A or B) 4 Q.H.
This course offers an examination of changing sex roles from the early Christian era through the eighteenth century and an assessment of their significance within the social and political context of pre-industrial Europe. Topics include society's attitudes toward the sexes; family structure and marriage patterns; and male and female roles in economic life and in religious and political movements.

23.198 Women In Modern Europe (Group B) 4 Q.H.
The course offers a study of women's position in Europe since 1789 to the present, focusing on their legal status and on their part in revolutionary movements, industrialization, war, politics, suffrage, socialism, and bourgeois feminism.

23.199 The Historian's Craft 4 Q.H.
The ways in which the historian studies the past and the nature of historical statements are examined. Problems considered include research techniques, changing conceptions of historical knowledge, and the relation between the historian and the society in which he works.

23.200 Social Science Methodology (Formerly Interdisciplinary Methods) 4 Q.H.
The course offers an introduction to social science methodology and quantitative techniques used in historical analysis.

23.201 Colonial America (Group C) 4 Q.H.
The course covers the discovery and exploration of the New World, the settlement of the English colonies on the North American mainland, their development to 1763, and the origin of their clash with England.

23.202 The American Revolution (Group C) 4 Q.H.
The course focuses on the coming of the American Revolution, its nature and progress, and its political, economic, and social aftermath.

23.203 Crime and Punishment: A History of the Criminal Justice System in America (Group C) 4 Q.H.

The course examines the evolution of the criminal justice system in the United States, with special emphasis on the impact of English common law, the changing role of law enforcement officers, reform movements, the female offender, the black experience, and the changing meaning of law and order in the United States.

23.204 Total Institutions and the Individual: An Interdisciplinary Approach (Group C) 4 Q.H.
Using the tools of history, psychology, and sociology, this course examines the varying effects that total institutions (such as prisons, asylums,

concentration camps, and the American slave plantation) have had on the human personality. An effort is made to develop a clearer understanding of how the human personality responds to such environments and of their stigmatic effects on the individual.

23.207 History of the Professions (Group C) 4 Q.H.
The course examines the evolution of the classic professions of law and medicine in the nineteenth century and the emergence of new professions in engineering, nursing, accounting, and social work. Themes include professional-client, professional-employer, and professional-governmental relations as well as education, professional organizations, and sex-stereotyping.

23.210 The United States to 1877 4 Q.H.
The course focuses on the history of the American people from 1763 to 1877, with an analysis of the American Revolution and the major political, constitutional, diplomatic, economic, and social problems of the new nation.

23.211 The United States since 1877 4 Q.H.
The course offers a continuation of the survey of American history, with discussion of the emergence of an industrial economy, an urban society, world responsibility, and expanded federal government.

23.212 Topics in American History (Group C) 4 Q.H.
Special topics in the history of the people of the United States from 1789 to the present.

23.213 American Urban History (Group C) 4 Q.H.
The course examines the development of urban society in the United States in the nineteenth and twentieth centuries, with emphasis on the effects of immigration and industrialization upon the politics, thought, and society of American cities.

23.214 History of Sport In America (Group C) 4 Q.H.
The course provides a history of the major sports and their impact on American life.

23.216 American Reformers and Reform Movements (Group C) 4 Q.H.
The course provides an analysis of American reform, especially in the nineteenth century.

23.218 The Civil War and Reconstruction (Group C) 4 Q.H.
The course focuses on the Civil War, its coming, its nature and progress, and the aftermath of Reconstruction.

23.220 The United States, 1890-1920 (Group C) 4 Q.H.
Topics include populism, progressivism, World War I, and the reaction of the 1920s.

23.221 The United States, 1920–1945**(Group C) 4 Q.H.**

The course examines the Depression, the New Deal, World War II, and mid-century, emphasizing the clash between liberalism and conservatism and the movement from isolationism to interventionism.

23.222 The United States since 1945**(Group C) 4 Q.H.**

The course focuses on America's diverse responses to postwar challenges of urbanization, economic change, civil rights, and Communism.

23.224 China and the United States**(Group C or D) 4 Q.H.**

The course offers an examination of the relations of China and the United States, including the period of the missionaries and opium traders; the era of special privileges; the Open Door policy; the first half of the twentieth century, when China became America's favorite protegee; and the years of strain, warfare, and finally accommodation after the Chinese communists came to power in 1949.

23.226 Governing Nineteenth-Century**America (Group C) 4 Q.H.**

The course offers an analysis of patterns of governing, with attention to public policy, the electorate, political parties, and interest groups, in the context of social and economic change in the nineteenth century.

23.230 The Westward Movement**(Group C) 4 Q.H.**

The course examines America's westward movement and its impact on the political, social, and economic life of the nation.

23.233 America and the Sea (Group C) 4 Q.H.

Topics include the history of exploration and discovery of America, the development of fishing, the rise of ocean commerce, the history of the American Navy.

23.234 American Military History**(Group C) 4 Q.H.**

A survey of the complex relation between American society and war, from the age of muskets to the neutron bomb.

23.235 American Diplomatic History**(Group C) 4 Q.H.**

The course focuses on the formation and administration of American foreign policy from the Revolution to the present.

23.239 The Roots of the Welfare State,**1883–1935 (Group C) 4 Q.H.**

The course concentrates on an examination of the formative years of the "welfare state" and the beginning of big government in America. Topics include the clash between new and old ways of governing during the gilded age, progressivism, and the New Deal, with attention to new policies in social welfare and morals,

transportation and commerce, taxation, civil liberties, and the process of politics.

23.240 The Growth of Government**since 1935 (Group C) 4 Q.H.**

This course offers an examination of the expansion of government in recent America and its impact on society. The size and cost of government is discussed from historical and non-American perspectives, and the evolution of welfare, taxation, management of the economy, presidential power, intergovernmental relations, and bureaucracy from Franklin Roosevelt's time are analyzed.

23.241 Topics in African-American**History (Group C) 4 Q.H.**

An in-depth examination of the major topics that have shaped the African-American experience. Among the areas to be included are slavery and its effects, the role of the antebellum free Black, the Civil War and Reconstruction, Black response to the new racism of the late nineteenth century, the W. E. B. DuBois-Booker T. Washington controversy, Marcus Garvey and the shaping of twentieth-century Black nationalism, and the changing nature of the Black revolution from Martin Luther King to Malcolm X and beyond.

23.244 The History of Boston (Group C) 4 Q.H.

The history of Boston from colonial times to the present, with attention to the topographical growth and the ethnic composition of the city.

23.245 History of Massachusetts**(Group C) 4 Q.H.**

This course focuses on the political, economic, social, and intellectual history of Massachusetts from the Constitution of 1780 to the present. The impact of war, immigration, and industrialization, and the orientation and integration of Massachusetts in the Union are studied.

23.246 The Industrial Transformation of**New England (Group C) 4 Q.H.**

This course examines the process by which New England evolved from an agricultural to an industrial society and the effects of industry's move from the area. Field trips to historical industrial sites are planned.

23.247 History of Media in America**(Group C) 4 Q.H.**

The course focuses on mass communication in American history, with special attention to the role of newspapers, magazines, books, films, radio, and television.

23.253 American Elites (Group C) 4 Q.H.

This course examines the life of elite individuals and groups in American society, especially in the nineteenth and twentieth centuries.

23.255 American Business History**(Group C) 4 Q.H.**

The course examines the rise of business in America, the role of the corporation, horizontal

and vertical combinations, business and labor, business and government.

23.258 Work and Leisure (Group B or C) 4 Q.H.
How we work and how we play are important determinants of how we live. This course examines the historical evolution of contemporary patterns of work and leisure across cultural, sexual, and class lines. Subjects include the impact of machine technology on the worker and the workplace; workers' organizing in unions and professional groups; changing concepts of the use of time; women's work and women's leisure; recreation and sports (both participant and spectator); and the rise of the cafe and the saloon as sociable institutions.

23.260 The American Woman (Group C) 4 Q.H.
An analysis of women's economic and social roles from the colonial period to the present is offered in this course, with special attention to women's work, their roles in family and community, and nineteenth- and twentieth-century women's rights movements.

23.264 Sport in Recent America (Group C) 4 Q.H.
The course offers an examination and analysis of current issues in American sport, including violence, commercialism, litigation, racism, sexism, and the roles of government and the media.

23.265 The Automobile in America (Group C) 4 Q.H.
The course focuses on the impact of the automobile on American society in a historical context. Topics include inquiry into the abandonment of traditional prohibitions of motorized carriages and examination of the use of planning, taxes, and highway policies to foster the use of the automobile. The effect of the car on land use, recreation, and the economy. Contemporary issues such as pollution and energy.

23.267 History of Flight and Space (Group A, B, or C) 4 Q.H.
Beginning with the dreams of flight of the ancient Greeks and Leonardo da Vinci, the course traces the history of nonpowered flight from the balloon experiments of the Montgolfier brothers to contemporary hanggliders; powered flight from the Wright brothers to the SST; and rocketry and space travel from its earliest beginnings to "Enterprise."

23.270 The World since 1945 (Group B) 4 Q.H.
The course offers a thematic study of issues and movements that have influenced the world's history since the end of the Second World War. Subjects include the Cold War, the end of colonialism, urbanization, technology and ecology, cultures and counter-cultures, the "global village," and the prospect for human liberation.

23.271 Third World Women (Group D) 4 Q.H.
This course provides an exploration of the role of women in the less-developed Third World areas, with special emphasis on factors of change, development, and continuity.

23.277 Modern Latin America (Group D) 4 Q.H.
Latin America from the mid-nineteenth century to the present. Dictatorial republics and continuing poverty and injustice; the struggles toward democracy, the rise of nationalism, and the threat of communism; relations between the United States and Latin America.

23.279 Canadian History (Group D) 4 Q.H.
The history of Canada from the time of European settlement to the present, with emphasis on Canadian relations with the United States and on the background of the Quebec separatist movement.

23.280-23.285 Teaching Practicum In History (each) 1 Q.H.
(Prereq. Department approval)
Students who wish to tutor peers in Western Civilization may do so by enrolling in these courses sequentially. Each course requires three hours per week of tutoring.

23.286 Fieldwork In History I 4 Q.H.
(Prereq. 23.101, 23.102, 23.210, 23.211, and 16 Q.H. in other history courses)
This course offers directed work in historical societies, archives, museums, and other historical agencies. Students should consult the Department of History for details.

23.287 Fieldwork In History II 4 Q.H.
(Prereq. 23.286)
The course offers directed work in historical societies, archives, museums, and other historical agencies. Students should consult the Department of History for details.

23.295, 23.296, 23.297 Junior-Senior Honors Program (each) 4 Q.H.
For prerequisites and other details, see the section on the Junior-Senior Honors Program on page 5.

23.299 Directed Study 4 Q.H.
93.131 Introduction to Women Studies: Image, Myth, and Reality 4 Q.H.
An introductory course in the study of women in society, this course encompasses the historical, political, economic, and social processes that have created both the image and reality of women in contemporary society, and offers an overview of the many different disciplinary approaches to the study of women.

93.164 Introduction to Irish Studies 4 Q.H.
Introduction to Irish Studies is taught from the perspective of a number of fields in one-week sequences: art, business, drama, history, literature, music, politics, and sociology. The

purpose of the course is to introduce students to the important forces that have helped to shape contemporary Ireland and Irish-American culture.

African-American Studies

25.100 African-Americans in Science, Technology, and Medicine 4 Q.H.

The course studies the contributions that African-Americans have made to the development of science and technology in America. It examines the cultural and social factors that have encouraged blacks to work in the fields of science (biology, chemistry, physics) and technology (engineering and medicine). Certification of blacks within the American scientific community and the availability of science to the past and contemporary African-American community are also explored. Readings, discussions, individual research topics, and interviews with black scientists, inventors/engineers, and doctors are used to develop the basic course material.

25.102 Education Issues and Minority Communities I 4 Q.H.

This course focuses on some of the important issues in today's urban elementary and secondary education systems. The analysis will look at the historical development of these issues, and students will be encouraged to think about and discuss their future significance.

25.136 The Economics of Urban Poverty 4 Q.H. Like most Americans and people from around the world, blacks migrated to central cities in America to better their economic conditions. However, unlike other migrants to urban centers, they were not assimilated into the social/economic mainstream, and there is evidence of flagrant job, housing, and educational discrimination against them even during periods of affluence. During recession or depression, their problems were compounded. Students have the opportunity to survey the above events from an economic framework.

25.150 History of Blacks in the Media and the Press 4 Q.H.

The course offers a historical and visual examination of the development of the African-American experience in the American mass media and press. Contemporary and historical literature, films, and people are a part of the study and analysis with respect to history, racism, images, psychology, and social movements. Newspapers, film, television, and radio are prime focal points, and they are used to help form strategies for the future of black Americans.

25.170 Economic Issues in Minority Communities 4 Q.H.

Minority lifestyles, perspectives, self-images, and social position in the urban community are all affected by economic factors, especially those specific to the minority poor. Students have the opportunity to examine these issues, particularly in terms of the application of basic economic theories to the economic realities of minority communities.

25.171 Poverty and Health Care 4 Q.H.

Why do the poor fail to get good health care? The course discusses problems of the poor and will examine the entire health care system, including Blue Cross and Blue Shield, Medicare and Medicaid, National Health Insurance, low-income barriers to health care, and future directions of medical health care.

25.178 Identity and Nationalism in Africa 4 Q.H.

How have centuries of imperialism, the struggle for national unity, and the continuing problems of racism and rivalry between factions affected the present identities and nationalist movements in Africa? This course explores problems peculiar to Africa and to any group of nations struggling against colonial ideas. Tribalism and the effects of European colonial partition on African identity are discussed.

25.180 Epidemiology of Black Diseases 4 Q.H.

Students are introduced to the science of epidemiology, the study of the occurrence of disease in populations. The concepts, principles, and methods of epidemiological analysis are explored with emphasis on specific diseases occurring with greater frequency in urban and black populations, such as cardiovascular conditions, sickle cell disease, and certain occupational and environmental illnesses.

25.191 Research Seminar 4 Q.H.

This course is divided into three parts, providing students the opportunity first, to identify a substantive area of their concern (e.g., welfare, political leadership, education) and to define a related problem in a research context; second, to be supervised in designing a research methodology most appropriate for examining the problem area; and third, to conduct extensive research, test the hypothesis, and draw conclusions based on data analysis techniques.

25.194 Field Research Seminar 4 Q.H.
(Prereq. Permission of Instructor)
Seniors have the opportunity to work with a faculty member on an individual basis, while carrying out a particular research project off-campus. Students are required to refine and polish a topic and outline for the senior thesis.

25.195 Directed Study for Senior Thesis 4 Q.H.
(Prereq. Permission of instructor)

The senior thesis is required of all African-American Studies majors; it offers students the opportunity to prepare a professional research paper under the close supervision of a scholar interested in students' particular research areas.

25.200 Introduction to African-American Studies 4 Q.H.

The course touches on several of the possible historical, sociological, cultural, and political avenues of study in the broad interdisciplinary spectrum of African-American Studies. It is intended to help provide an introductory overview of the field and will offer students the opportunity to identify areas for more specific focus.

25.201 African-American Literature I 4 Q.H.

The course offers a survey of African-American literature from the period of slavery to the present, with an emphasis on literature concerning the relation between the rise of the black American and the development of African-American literature. The black experience as it is revealed in literature will be important in the discussion.

25.202 African-American Literature II 4 Q.H.
(Prereq. 25.201 or permission of instructor)

This course continues the survey of African-American literature; its primary focus, however, is on principal writers and their major themes.

25.203 The Black Novel 4 Q.H.

The black novelist belongs to a unique literary group in the history of American fiction. Special attention is given to Chesnutt, Toomer, Wright, Ellison, and contemporary novelists, and to their different perceptions of the black experience in America.

25.208 African Civilization I 4 Q.H.

This course deals with the ancient empires of Africa, especially Ghana, Songhai, Mali, Zimbabwe, the city states of East Africa, and also the Congo Kingdom. Included are Ethiopian as well as Egyptian history and the controversies surrounding their histories to 1800.

25.209 African Civilization II 4 Q.H.
(Prereq. 25.208 or permission of instructor)

This course on African civilization covers the period from 1800 to the present era. Emphasis will be placed on the relation between Europe and Africa, the circumstances surrounding the

imperialist partition of Africa, and the de-colonization process.

25.210 Contemporary Issues in Black Society 4 Q.H.

This course offers an introduction to the various issues and problems that confront black Americans, including some of the realities of the social, political, and economic problems of contemporary black experience. Students are asked to assess the validity of specific social theories in relation to the black experience.

25.211 Survey of Black Theatre and Drama 4 Q.H.

Theatre in America has been an important reflector of the national experience, and black theatre, especially in recent years, has served the same purpose for the black community. The course focuses on the development of black drama during the nineteenth and twentieth centuries, with emphasis on modern developments and their political and cultural significance.

25.212 The Black Family 4 Q.H.

How does the black family function, both interpersonally and as a social unit? Anthropological and sociological theories deal with variations in family structure and the function of the black family in black society. The effects of slavery and colonization on the black family structure and functions are also explored. A side issue is a discussion of some of the differences and similarities between African, African-American, and African-Caribbean families.

25.213 History of South Africa 4 Q.H.

(Prereq. 25.209 or permission of instructor)
Initial attention is directed toward pre-colonial South Africa and the conflict between Africans and the Dutch and English settlers. The course then focuses on the formation and transformation of colonial policy after World War II, with particular emphasis on racism, neo-colonialism, liberation movements, and international involvement in the apartheid system.

25.214 History of East Africa 4 Q.H.

The first section of the course deals with the pre-colonial period and the problems of the partition of Africa. The second section focuses on the classical colonial period and the transformations of colonial policy after World War II, with particular emphasis on the ambiguity of de-colonization and those features of the colonial system that seem to have become a part of the East African social and political environment.

25.215 History of West Africa 4 Q.H.

The history of West Africa has included the struggle for internal unity, economic development, and social justice. The Pan-Africanist ideology, W. E. B. DuBois's writings, African socialism, and the consolidation of power and leadership are some of the topical objectives in this study of African liberation, particularly the rise of West Africa.

25.216 The Black Experience in the Caribbean 4 Q.H.

The course offers a descriptive and interpretive analysis of the growth of the modern black community in the Caribbean. Although the focus will be on the contemporary period, the course will examine that period in the context of colonialism and slavery in the Americas. Important racial, social, political, economic, and religious issues will be addressed.

25.218 Black Man/Black Woman 4 Q.H.

Sociological and anthropological methods are used to examine black male and female personality development, as well as the development of black male and female behavior, self-image, sexual roles, and behavior within both the black and the white communities.

25.222 Third World Political Relations 4 Q.H.

This course offers a comparative regional analysis of the political systems of third world nations of Africa, Asia, Latin America, and the Caribbean. Emphasis is on development strategies; problems of development, including national identity, political socialization and participation, national defense, and urbanization; and the positions of third world nations in the international community.

25.224 Black Cultural Development in the United States 4 Q.H.

The course focuses on the rise of a distinctive black culture in the United States, with emphasis on examining the premise that the black population in America has developed a cultural system that operates as a subsystem of the American cultural norm.

25.234 Africa Today 4 Q.H.

With increasing numbers of nations striving for economic and political control in Africa, and with imperialist and colonial ideas remaining in the living memory of Africans, Africa presents a complex political and social picture to the rest of the world. This course examines some of the salient features of black art, politics, and identity in Africa.

25.236 Religion in Black American Society 4 Q.H.

Black life in America cannot be fully understood without a sense of the importance of religion in the community. This course looks at the impact of religion on social structures, group behaviors, moral codes, and belief patterns in black society. Topics include the church as a social organizer, the role of the black minister in the community, and the variety of black denominations in urban and rural areas.

25.237 African-American History I 4 Q.H.

This survey covers the development of black America from the period of slavery through Reconstruction, with emphasis on the historical

links between Africa and America and their impact on black development in the United States.

25.238 African-American History II 4 Q.H.

(Prereq. 25.237 or permission of instructor)

This course examines the development of black America from Reconstruction to the present, and the effects of events in the United States and world history on the development of black America. There is special emphasis on contemporary issues and how these issues can be seen through a historical perspective.

25.246 Survey of Contemporary Black Political Movements 4 Q.H.

The modern black political movements were inspired by a full-scale evolution of black political thought in America. Analysis of this evolution examines socio-political contests that have served as catalysts to these modern movements.

25.247 Racial Integration and Its Impact on Education 4 Q.H.

This course offers an examination of the historical struggle for desegregation. This course analyzes current urban issues in racial integration and some of the projected effects of integration.

25.255 Public Policy Analysis 4 Q.H.

The course analyzes the dynamics of the public policy formation process at the local, national, and international levels, with particular attention to the implications of public policy for minority groups. Emphasis is placed on a critique of the policy maker's role and power in the socio-economic setting.

25.267 Black Political Behavior 4 Q.H.

The course provides an introductory examination of the social and psychological dynamics of black political participation. Main issues of the course include identity and political socialization and their impact on black voter turnout and partisan choices.

25.269 Race Relations in America 4 Q.H.

The course offers an examination of the interrelations of ethnic, cultural, and minority groups in the United States. Focus is on the nature of racial conflicts, discrimination, reverse discrimination, personal and institutional racism, and racial and ethnic stereotyping. Discussion considers avenues of improvement in attitude awareness and change.

25.270 Black Political Thought 4 Q.H.

How do the black people as a unit view the American political system and black people's chances of improving their lot in this country? This course examines black opinions, from the radical to the ultra-conservative, of the United States political system. The focus is historical in context and will address notions of political socialization and the development of black political ideologies.

25.271 Survey of African-American Art 4 Q.H.
Black art, like black literature, has always been an important aesthetic social statement by the African-American artist. This course offers a historical and critical examination of African-American art from the nineteenth century to the present, with special emphasis on the effects of European and African art styles on the black artist in America.

25.272 Analysis of Comparative Slavery 4 Q.H.
Slavery has had major psychological effects on the shaping of the black American experience, as well as on the experience of blacks throughout the world. An analysis of the sociological implications of slavery on group interrelations, social norms, and cultural aberrations covers several national versions of the slave system in Africa, Europe, the Caribbean, and North and South America.

25.273 Analysis of the Slavery System in America 4 Q.H.

This course attempts a comprehensive survey of the realities of the slavery system in America, with focus on the impact of slavery on blacks as well as on the society that perpetrated the system. Examination of slave narratives and other historical documents will provide insights into the origin of the slavery system and the way it functioned until the Emancipation Proclamation.

25.278 Black History of Boston 4 Q.H.

This course examines the social, economic, political, and educational history of Boston's black community in the nineteenth and twentieth centuries. The development of the black community and its institutions is a major focus, and students are encouraged to study the past in an attempt to understand the present and interpret the future. Research data include participant observation, oral history, interviews, and primary and secondary source materials.

25.281 Survey of African-American Music 4 Q.H.

Black music has evolved in fascinating ways over the past hundred years. Topics include the impact of African rhythm on black music, the New Orleans coalescence, regional development, ragtime, the emergence of large bands, the harmonic revolution of the 40s, bebop, the 1960s avant-garde, and subsequent developments. Some analysis of specific jazz phenomena is included.

25.283 Seminar: Creative Expression in Blues and Jazz 4 Q.H.

Blues and jazz have been among the most far-reaching and original artistic expressions of blacks in America. The course touches on possible African sources of inspiration for the musical literature of blues and jazz; a more important focus, however, is on blues and jazz as a

reflection of African-American life and on the impact these musical forms have had on black self-image and position in American culture.

25.290-294 Directed Study 4 Q.H.

Directed study offers the ambitious student the opportunity to pursue a special intellectual interest not covered by the Department course offerings and to work on this interest with the Department faculty member of his/her choice. The faculty member will closely supervise the project and act as adviser for the duration of the quarter.

25.295-298 Junior-Senior Honors Program 4 Q.H.

For prerequisites and other details, see section on the Junior-Senior Honors Program on page 5.

The following courses may be of interest to the student wishing to concentrate in African-American Studies. Descriptions for these courses may be found in the appropriate department listing.

- 21.145 Urban Society
- 21.150 Race and Ethnic Relations
- 21.270 Class, Power, and Social Change
- 20.250 Political Anthropology
- 20.255 Economic Anthropology
- 20.259 Urban Anthropology
- 22.132 Political Behavior
- 22.133 Political Parties and Pressure Groups
- 22.137 Civil Liberties
- 22.171 Law and Society
- 22.228 Government and Politics in Africa
- 22.233 International Law
- 22.242 The Politics of Revolution and Change
- 22.245 The Politics and Policies of Developing Nations
- 22.270 Political Theory
- 22.278 Contemporary Political Thought
- 26.101 Introduction to Philosophy
- 26.102 Introduction to Philosophy II
- 26.155 Moral Philosophy
- 26.120 Existentialism
- 26.131 Social and Political Philosophy

Philosophy and Religion

26.101 Introduction to Philosophy 4 Q.H.

An examination of some of the central and persistent issues in philosophy, including theories of reality, theories of knowledge, the problem of evil, the problem of suffering, and problems in religion. Please note that not all sequences treat the same philosophical problems.

26.103 Introduction to Religion 4 Q.H. (Formerly 26.183)

This course seeks to identify and appraise different ways of being religious: primitive, mystical, dogmatic, and ritual. Emphasis is placed upon appreciating the unique standpoint that each requires, how each sees the world in a radically different way, and how that leads to distinctive ways of life.

26.104 Understanding Religious Man 4 Q.H. (Formerly 26.177)

This course examines several important explanations of the nature, origin, and present significance of religious experience, beliefs, and practices in the light of modern knowledge and attitudes.

26.110 Classical Greek Philosophy 4 Q.H. (Prereq. 4 Q.H. philosophy)

An exploration of classical Greek philosophy, the course starts with a study/discussion of the roots of Western thought in the sixth century B.C. and argues the reasons for our debt to these original thinkers who were concerned with explaining the principles of external nature and the problems of human knowledge and conduct. Central to understanding these problems is the study of Socrates and his adversaries, the Sophists, and his student, Aristotle. The course also covers Roman philosophy, the Stoics, and the Sceptics who are a prelude to the early Christian philosophers of the first century A.D. Throughout the course, attention is placed upon the interplay between the philosopher and the moral, social, and religious context in which his thought arises. Student participation in class discussion is very important to the course.

26.111 Modern Philosophy 4 Q.H. (Prereq. 4 Q.H. philosophy)

The 100 years between 1650 and 1750, sometimes called "the century of genius," were a period in which philosophers reacted to the new scientific discoveries of Copernicus, Kepler, and Galileo. Out of this reaction came new ways of thinking about the nature of knowledge and the nature of the world itself. The course focuses on the development of the rationalist and empirical philosophies during this period, with emphasis on Descartes, Leibniz, Spinoza, Locke, Berkeley, and Hume.

26.115 Chinese Philosophy 4 Q.H.

This course offers a study of Chinese

philosophy in the ancient period (until 221 B.C.). Emphasis is placed on Confucianism, Taoism, and the *I Ching*. Less emphasis will be placed on the Logicians, the Mohists, and the Legalists.

26.120 Existentialism 4 Q.H. (Prereq. 4 Q.H. philosophy)

Existentialist philosophy is examined in its greatest representatives, such as Kierkegaard, Nietzsche, Dostoevski, Heidegger, Jaspers, and Camus, with major attention given to Jean-Paul Sartre and Maurice Merleau-Ponty. The focus of this course will be on central themes, including self-alienation, unauthenticity, authenticity, and existential experiences. Existential philosophy is examined in its historical, social, and cultural relations, and in its influence on psychology, psychoanalysis, sociology, political science, and literature, both in Europe and in the United States.

26.121 Analytic Philosophy 4 Q.H. (Prereq. 8 Q.H. philosophy)

The development of the analytic movement from its beginnings in the early works of Moore and Russell. Some treatment of Russell's logical atomism, the logical positivists, the thought of Ludwig Wittgenstein, and their widespread influence.

26.122 Freud, Skinner, and Their Critics 4 Q.H. (Prereq. 4 Q.H. philosophy or permission of instructor)

The course provides an examination of fundamental themes and concepts of Freud's psychoanalysis and Skinner's psychology from a philosophical perspective, and criticisms of them from the point of view of reformed Freudians and existentialists. Selections include Freud, Jung, Adler, Karen Horney, Skinner, Koestler, Pearls, Sartre, Merleau-Ponty, and Kovaly.

26.124 Philosophy of Psychology 4 Q.H. (Prereq. 4 Q.H. philosophy or 4 Q.H. psychology or permission of instructor)

The course offers an examination of the philosophical and scientific foundations of behavioristic psychology, with emphasis on the acquisition and use of language. Discussion of alternative conceptions, e.g., Chomsky's and those arising from computer studies.

26.125 Philosophy of Mind 4 Q.H. (Prereq. 4 Q.H. philosophy)

What is the relation between mind and body? Is the mental merely a function of bodily process and behavior or does it somehow exist "over and above" the material? How are self-knowledge and knowledge of other minds achieved? What is the relation between words and thoughts? This course, in part, seeks to show what puzzles and problems result from an honest attempt to answer these questions in a reasonable way.

Classical sources, such as Descartes and Locke, and contemporary sources, such as Wittgenstein and Putnam, are examined. But the course also seeks to arrive at some *answers*—however tentative or provisional—to these questions. The student is constantly challenged to think and write well about these difficult subjects.

26.126 Philosophical Problems of Law and Justice 4 Q.H.

The course offers a consideration of philosophical issues concerning the law and its enforcement, with focus on such areas as the nature of law, the enforcement of morality, the limits on legal interference with individuals, the justification of punishment, and alternatives to punishment.

26.127 Philosophy of Language 4 Q.H.
(Prereq. Permission of instructor)

The course examines prospects for a theory of language, its syntax and semantics. Contrasts between theory of reference and theory of meaning. Are there universals of language? Relations between linguistics and psychology. Readings from Frege, Quine, Russell, Chomsky, and Fodor.

26.130 Aesthetics 4 Q.H.
(Prereq. 4 Q.H. philosophy)

This course offers a historical approach to aesthetics. Aesthetics is the philosophical analysis of concepts and the solution of problems that arise when one contemplates beautiful (or ugly) objects; it is also concerned with standards of value in judging art. Aesthetics asks the following questions: What features make objects beautiful (or ugly)? Are there aesthetic standards? What is the relation of works of art to nature? What is the nature of an aesthetic experience?

26.131 Social and Political Philosophy 4 Q.H.
(Prereq. 4 Q.H. philosophy)

What basis is there for a citizen to obey the laws of his state? What gives some people the right to rule over others? What are the limits on what a state can legitimately demand of its citizens? Should the state simply require persons not to harm one another? Should it control the economy and guarantee a particular standard of living for its citizens? These and other questions are dealt with in the context of recent philosophical debates about political and economic rights. Anarchism, libertarianism, socialism, and capitalism are among the doctrines studied. Readings include selections from Robert Nozick's *Anarchy, State and Utopia* and John Rawls's *A Theory of Justice*.

26.133 Philosophy of Science 4 Q.H.
(Prereq. 4 Q.H. philosophy)

Science is the dominant intellectual force of our culture. This course focuses on the nature of

scientific method, scientific theories, and scientific explanations. A central question is: Why is science thought to provide the most reliable account of the nature of reality? Various theories about the nature and reliability of science are considered.

26.134 Philosophy of Religion 4 Q.H.
(Prereq. 4 Q.H. religion)

The basic question in this course is "Does God exist?" The course examines several major arguments affirming and criticizing the notion of God's existence. A central problem in recent philosophy of religion is whether or not it makes any sense to speak of the truth (or falsity) of religious belief, as well as the implications an answer to that issue has for religious life; this topic will be examined in the latter half of the course. In addition, each student is required to write an essay on the basic question from any point of view relevant to the issues discussed in the course.

26.135 Philosophy of Human Nature 4 Q.H.

The course offers a philosophical inquiry into the theories of man, man's dimensions, and human nature. The question of the existence of human nature is thoroughly examined. Special interest will be given to contemporary theories of man and self-alienation, and their influence in social sciences. Selected readings from Descartes, Hobbes, Hegel, Marx, Kierkegaard, Maritain, Freud, Skinner, Fromm, and Frankel.

26.136 Existentialism and Literature 4 Q.H.

After World Wars I and II, existentialist philosophy inspired the literature of "extreme situations." This course examines human extreme experiences in existentialist philosophy and novels. Some of the major themes are loneliness; self-alienation; social pressures; conformity; absurdity; anxiety; social, political, and moral crises; nothingness; and death. Selected readings will include the most influential European and American authors.

26.137 Philosophy and Literature 4 Q.H.

The purpose of this course is to provide the student the opportunity to learn to recognize, appreciate, and criticize philosophical themes in literature. The readings typically include acknowledged classics by philosophical authors such as Voltaire, Dostoevski, and Sartre, as well as such popular contemporary authors as Vonnegut, Barth, and Pynchon. There are also some readings from more straightforward philosophical sources. Philosophical topics include the meaning of life, the human condition, depersonalization, alienation, human freedom, questions of value, responsibility, rationality, and personal identity. Religious, nihilistic, existential, and other points of view are explored.

26.144 Technology and Human Values 4 Q.H.

The course examines the changing values of the modern, technologically advanced world. Our study attempts to increase our understanding of the supposed breach between the literary and scientific cultures, the diverse approaches toward their reconciliation, and the human dimensions of science and technology. Other relevant topics are the neutrality of technology with respect to good or evil uses, technology as an instrument for human liberation, and the issue of proper and effective modes of controlling technology in today's world. Pirsig's widely read paperback, *Zen and the Art of Motorcycle Maintenance*, is studied, as is Lynn White's *Dynamo and Virgin Reconsidered*. Other important writers to be considered include Kurt Baler, J. Bronowski, Barry Commoner, Erich Fromm, Karl Marx, and C. P. Snow.

26.145 Technology and the Individual 4 Q.H.

This introductory course attempts to awaken some philosophical reflectiveness regarding the potential benefits and threats to individuals that derive from technological change. The course explores and discusses such issues as the relation of technology to human freedom and privacy, the effects of "future shock" upon the individual, the possibility of the tyranny of a technological elite, and the prospects for the transformation of humankind. Some writers see technology as the salvation of humanity; others see technology leading to dehumanization, a decrease of freedom, and a developing sense of alienation; still others see the extinction of "human nature" as we once knew it. Where is the truth in all of this? What are the social, psychological, and philosophical meanings and consequences of technological change in our day and in the future? Some of the major readings for the course are from Alvin Toffler's *Future Shock*, Herbert Marcuse's *One Dimensional Man*, Jacques Ellul's important criticism *The Technological Society*, and Lewis Mumford's *The Transformation of Man*.

26.148 The Meaning of Life 4 Q.H.

The course offers an examination of selected philosophical problems of human existence in the contemporary world, with major emphasis on the search for identity and self-fulfillment. Selected problems are discussed, such as freedom, death, sexuality, alienation, becoming a person, and peak experiences. The course includes readings from Kierkegaard, Heidegger, Sartre, Camus, Maslow, Allport, Frankel, Rogers, and Rollo May.

26.149 Informal Logic 4 Q.H.

An introduction to principles of sound reasoning with an emphasis upon relevant, *informal* considerations such as the various uses of language and semantics, the recognition and evaluation of arguments in ordinary discourse,

and special problems about meaning. This course will virtually exclude formal symbolisms and methods. It is open to all students and should prove especially helpful to journalism and pre-law students.

26.150 Introduction to Logic 4 Q.H.

The course offers a study of Aristotelian logic, covering basic concepts of logic, the evaluation of arguments, and the informal fallacies. Some of the basic concepts covered are argument, difference between deduction and induction, validity and truth. The informal fallacies deal with the common errors in argumentation.

26.151 Symbolic Logic 4 Q.H.

The course offers a presentation of the syntax and semantics of propositional logic and first-order quantification theory. Relations between these systems and natural language are considered. The course covers analysis of the notion of derivation within a system and the notion of logic consequences, and practice in analyzing logical structure in natural language sentences.

26.152 Theory of Knowledge 4 Q.H.

(Prereq. 4 Q.H. philosophy or permission of instructor)

This is an introduction to epistemology, or theory of knowledge, which asks the following questions: What is knowledge? Is knowledge (or even certainty) attainable? What are the limitations of human knowledge? How is knowledge—if we have it—acquired? What roles do reason and experience play in the attempt to attain knowledge? This course uses both classical (Rene Descartes and David Hume) and contemporary sources (Bertrand Russell and others). Various theories of knowledge, such as empiricism, rationalism, and scepticism, are examined and criticized. The student is encouraged to form at least tentative opinions on these issues.

26.153 Metaphysics 4 Q.H.

(Prereq. 8 Q.H. philosophy)

The course offers a consideration of central problems and theories concerning the nature of reality, with special attention to such areas as the relation between mind and matter, free will and determinism, and criteria of existence.

26.155 Moral Philosophy 4 Q.H.

(Prereq. 4 Q.H. philosophy or religion or permission of instructor)

What sorts of things are good and bad? What actions are right and wrong? These two basic questions are explored. The course covers major classical conceptions of ancient Greece and Rome, their replacement by the Western religious ethic, its modification and rejection in the early modern period, and the emergence of modern versions of traditional conceptions of the good life, with reflections on the nature of ethical inquiry itself as a legitimate study.

26.159 Ethics: East and West**4 Q.H.**

Is there a *best* way to live? Is there a way a human being *should* live? In both Eastern and Western philosophy there are claims that a way of life exists that leads to happiness, power, and wisdom. This course explores this claim by studying the thought of such philosophers as Socrates, Buddha, Plato, Aristotle, Lao Tzu, Epictetus, Marcus Aurelius, Aquinas, and Spinoza, as well as by studying some of the classical Hindu and Buddhist texts.

26.162 The Ethics of Human and**Animal Experimentation****4 Q.H.**

This course explores the conflicts that arise between the value of free scientific inquiry on the one hand, and the rights, vulnerabilities, and sufferings of human and animal subjects on the other. Topics include traditional issues involving informed consent, voluntariness, coercion, experimental design, risk-benefit analyses, institutional review boards, and professional guidelines, as well as such less traditional issues as the competing conceptions of progress and whether we have obligations to non-human animals.

26.163 Ethical Issues of Taxation**4 Q.H.**

Although we tend to believe that persons have a right to their own labor, a right to their own property, and a right to exchange their labor or property for the labor or property of other consenting adults, it seems that income taxes, property taxes, and sales taxes violate these rights. This course explores two basic questions: Is *any* taxation morally justified? Are there moral grounds for choosing among taxation policies? Specific topics include competing conceptions of private property; the "progressive versus regressive taxation" controversy; the alleged problems with interpersonal utility comparisons; and questions involving the distribution of tax monies, e.g., whether those who have more than they need have any moral obligation to provide for the needs of the poor.

26.165 Medicine, Religion, and the Healers' Art**4 Q.H.**

This course explores aspects of the historical, religious, and cultural context for contemporary alternatives in health care, beginning with an examination of several examples of traditional healing practices and their accompanying religious and philosophical views about human life. Course material explores this "holistic" tradition in two frames of reference: the ascendancy of scientific rationalism over religion, and the takeover, by male-dominated professions, of healing functions that society has traditionally assigned to women (e.g., the rise of obstetrics and the suppression of midwifery). Special attention is given to major women healers of the nineteenth century. Course includes a look at some contemporary

efforts at reintegration of scientific and traditional values in the modern health care system. Students will also meet and interact with patients and healers active in the modern holistic health movement.

26.166 Philosophical Ethics and Journalism**4 Q.H.**

This course examines classical ethical theories such as utilitarianism and Kant's categorical imperative and seeks to apply them to the moral problems of professional journalism. It will explore the question of whether journalists face moral obligations beyond those delineated in professional ethical codes. Other areas examined could include objectivity in reporting, questions about possible limits on the duty to inform, and consideration of what special rights and responsibilities, if any, journalists have by virtue of being journalists.

26.168 Moral Problems in Medicine**4 Q.H.**

This course examines two fundamental ethical systems, one of which is grounded on the dignity of the person, the other on the intrinsic value of happiness. The course then explores the difficult issues of euthanasia, suicide, paternalism, medical experimentation, the patient's right to consent to any therapeutic intervention, and the concept of death with dignity. After studying these and related moral issues, the larger economic and policy issues of justice, some of which are current in political debates are examined (for example: Is there a right to health care?). It is hoped that this course will encourage the student to become more sensitive to moral problems as they arise in medical settings, better able to deal with these troublesome issues, and perhaps more courageous in facing them if that becomes necessary. The course also offers an investigation into the questions of abortion, euthanasia, infanticide, genetic counseling, psychosurgery, and human experimentation from the standpoint of both philosophical ethics (such as the theory of the end justifying the means) and religious ethics (such as the natural law theory of the Roman Catholic Church).

26.170 Western Religions**4 Q.H.**

Western religion is grounded in the experience of God's presence, which transcends and transfigures the life of the individual and the community. This encounter is the essence of Judaism, Christianity, and Islam. Drawing on autobiography and biography, this course delves into the personal religious quests of such major religious thinkers as St. Augustine, St. Theresa, Martin Luther, Elie Wiesel, Richard Rubenstein, Dietrich Bonhoeffer, and Mohammed.

26.171 Eastern Religions**4 Q.H.**

Eastern religions appear to be fundamentally different from the orthodox religions of the West. Not only do Hinduism, Buddhism, and

Taoism promise a solution to the problem of suffering (compare the common Christian and Jewish attitudes), but most of these religions do not have a central God personality, and some explicitly reject such a concept as meaningless, or at least as irrelevant to leading a religious life. Central to these views is a way of being in the world which emphasizes meditation, skillful and compassionate action, and a direct awareness of the fundamental nature of reality. The course first tries to make sense of the difficult notion that the way we perceive reality may be illusory. It then examines Theravada Buddhism, a religion that rests on the insights that everything is impermanent and that it is possible to live fully in the present without any suffering. From Theravada Buddhism, the course turns to Mahayana Buddhism, and then to Taoism, a subtle view that emphasizes the "flow" of life and that "the way to do is to be." Next, the most explicit of the mystical religions, the Hinduism of the *Upanishads*, is examined. As part of the exploration of this form of Hinduism, students are given the opportunity to examine intellectually and also to practice a few methods of meditation. In addition, the course investigates the devotional aspect of Hinduism as expressed in the *Bhagavad Gita*.

26.173 Cults and Sects 4 Q.H.

This course offers an examination of the varieties of religious experience from the perspectives of sociology and psychology of religion. This course focuses on such cultic and sectarian groups as Christian Science, the American Shakers, the Unification Church, the Hare Krishna movement, and the Black Muslims. The primary purpose of this course is to provide the student the opportunity to acquire critical investigative tools with which to analyze different religious expressions.

26.174 Islam 4 Q.H.

The course explores the history of Islam, its conflicts with the West in past and present, Islamic beliefs, the future of Islam as a world religion, and relations of Islam with Christianity and Judaism. Since Islamic faith touches upon social, political, and legal issues, the course is concerned with them as well as with the more familiar religious and theological questions.

26.176 Understanding the Bible 4 Q.H.

This course introduces students to the Old and New Testaments, so that they may enter into a dialogue with the Bible, understanding not only what it says, but why it is said that way. To do this, discussion focuses on the Bible's social, political, and cultural backgrounds.

26.178 Religion in a Social Context 4 Q.H.

This course offers an exploration of the social forms of religion. The structures and roles of the church, synagogue, and sect are described and critically evaluated. In addition, emphasis is

given to their functions, with reference to general social structure, process, and reform.

26.182 Religion in the Age of Science 4 Q.H.

This course examines the problems posed by the interaction between religion and the natural and social sciences. Representative selections from Hume, Darwin, Marx, Freud, Erickson, and Troeltzch are used to interact with selections from Bultmann, Teilhard de Chardin, Niebuhr, Bonhoeffer, and Tillich.

26.187 The Meaning of Death 4 Q.H.

This course offers an inquiry into different philosophical and religious perspectives on death and life after death, including an examination of some powerful contemporary accounts of personal confrontation with death, along with investigations into attitudes toward death in other traditions (e.g., Hinduism and Buddhism). In addition, the course explores responses to the Holocaust in Europe, and theories about life after death (such as those discussed in Raymond Moody's *Life After Life* and Ian Stevenson's *Reincarnation*).

26.188 The Occult as Religion 4 Q.H.

The course focuses on the history, aims, and methods of such esoteric or mystic doctrines as astrology, numerology, magic, demonism, and divination, and investigates the structural similarities of these religious forms to those of the dominant religious traditions of the world.

26.189 Philosophy of Death, Grief, and Dying 4 Q.H.

This course explores fears about death and dying and the grieving process, and examines the processes people sometimes experience while dying. In addition, the course examines current practices of caring for the dying and of coping with bereavement, questioning whether these practices are, in fact, healthy, helpful, and/or ethical. Other relevant ethical issues to be examined include euthanasia, truth-telling with the dying, suicide, and paternalism. The course will close with the question of the meaning of life, given the fact that we must die.

26.190, 191, 192 Honors I, II, and III (each) 4 Q.H.

Students interested in taking Junior-Senior Honors courses should confer with Department Chairperson. Arrangements are made between the student and a member of the faculty. *Staffing*: by arrangement.

26.195 Directed Studies 4 Q.H.

(Prereq. By arrangement between student and faculty.)

Those interested in the Directed Studies program should meet with Department Chairperson. *Staffing*: by arrangement.

26.251 Advanced Logic 4 Q.H.

(Prereq. 26.151)

The course offers a study of the major results in the meta-theory of first-order logic. Consistency,

completeness, and decidability. Discussion of the general notion of an effectively computable process, Church's thesis, and the existence of unsolvable problems.

26.267 Seminar in Nietzsche 4 Q.H.
(Prereq. 8 Q.H. of philosophy or permission of instructor)

26.276 Mysticism: East and West 4 Q.H.
(Prereq. 26.104 or permission of instructor)

The course offers an inquiry into mystical experience through a comparative study of the writings of Christian, Buddhist, and Hindu mystics and of secondary interpretive sources. Areas taken up are the potential oneness of man and God, the conflict of mystics with traditional

forms of religion, and the possibility of a common, cross-cultural basis for mysticism.

26.290 Issues in Medical Ethics 4 Q.H.
(Prereq. permission of instructor)

This course focuses on issues in medical ethics, especially as they are likely to arise in a clinical setting. Course begins with exploration of the two basic systems of ethical theory and then concentrates on their application in cases exemplifying the issues of euthanasia, paternalism, experimentation, informed consent, quality of life, professional responsibility, right to health care, truth telling, genetic control, abortion, and the allocation of scarce medical resources.

Art and Architecture

27.105 Introduction to Fiberart 4 Q.H.*

This course is an introduction to fiberart techniques, including simple looms, with emphasis on designing and creating two- and three-dimensional wall hangings, sculpture, and functional works.

27.113 Creative Drawing 4 Q.H.

The course focus is on basic drawing in pen and ink, pencil, charcoal, brush, and related media. Course includes fundamentals of form, volume, and texture in drawing.

27.115 Basic Painting 4 Q.H.

This is an introductory studio course in the fundamental techniques of painting. Formal problems in the study of color, light, space systems, form, and composition establish the foundation for more individual creative expression. Critiques and slide lectures are used as needed.

27.118 History of Art to 1400 4 Q.H.
(Formerly History of Art I)

The course provides a survey of Western art from prehistoric times to the Renaissance.

27.119 History of Art since 1400 4 Q.H.
(Formerly History of Art II)

The course provides a survey of Western art from the Renaissance to the twentieth century.

27.121 Contemporary Directions in Cinema 4 Q.H.*

The course offers a comparative study of selected films by major contemporary directors. Film screenings, discussions, assigned readings, and lectures.

27.129 Photo Silkscreen 4 Q.H.*

The course focuses on creative use of the photo silkscreen process, developing ideas visually through a combination of photography and

hand-cut stencils. Emphasis is on organizing relations between the forms in order to communicate the idea effectively. No previous knowledge of photography or silkscreen necessary.

27.131 Ancient Art 4 Q.H.

The course offers a concentrated study of art from prehistoric times to Greek civilization, including Egyptian, Mesopotamian, and Aegean art.

27.136 Classical Art 4 Q.H.

The course offers a concentrated study of Greek and Roman sculpture, architecture, and painting.

27.137 French Painting 4 Q.H.

The course examines French painting of the nineteenth century, focusing on romanticism, realism, impressionism, and their cultural implications.

27.139 Medieval Painting and Sculpture 4 Q.H.

The course focuses on Romanesque and Gothic painting and sculpture from the tenth to the fifteenth centuries.

27.143 Mexican Art 4 Q.H.

The course offers a concentrated study of pre-Columbian art from the archaic and classical periods to the present.

27.144 Latin American Art 4 Q.H.

The course focuses on the arts of architecture, sculpture, and painting of various countries of Latin America except Mexico, from pre-Columbian times to the twentieth century.

27.150 History of Photography 4 Q.H.

The course offers a study of development of photography from early nineteenth century to present.

27.151 Modern Painting 4 Q.H.

The course provides a survey of twentieth-century painting, including major schools such as Impressionism, cubism, surrealism, and expressionism. Course includes visits to museum collections and contemporary art galleries.

27.152 Introduction to Art 4 Q.H.

The course offers a basic introduction to the characteristics of the visual arts, including painting, sculpture, graphic arts, and architecture. Various examples of works of art are studied as an introduction to style and technique. Course includes visits to museum collections and contemporary art galleries.

27.155 History of Marine Painting 4 Q.H.

A study of the image of the sea as used by various painters. The work of such artists as Turner, Delacroix, Monet, Rembrandt, and many others will be examined stylistically within a historical context.

27.161 American Architecture 4 Q.H.

This course provides a survey of major developments in American architecture from colonial times to the present, with emphasis on stylistic developments and influences affecting architectural directions in America.

27.162 American Sculpture and Painting 4 Q.H.

A survey of major developments in American sculpture and painting from colonial times to the present, this course emphasizes stylistic considerations and influences affecting the development of these art forms.

27.163 The American Film 4 Q.H.*

A historical survey of the unique rise of the American film and its influence on a burgeoning new international art form. Key films representing major aesthetic or technical developments from the late nineteenth century to the present are screened weekly and discussed.

27.175 Late Nineteenth-Century American Architecture 4 Q.H.

The course offers a survey of the "stick and shingle" architectural styles, as well as more general developments. Introductory lectures are followed by student presentations on selected topics.

27.176 Contemporary Architecture and the City 4 Q.H.

The course offers a study of the great figures and chief movements of American and European architecture and city planning of the twentieth century.

27.177 Introduction to Architecture 4 Q.H.

The course offers a survey of the stylistic characteristics of architecture from ancient periods to the present.

27.178 Technology, Architecture, and the City 4 Q.H.

The course offers an examination of the role of technology and architecture in shaping the built environment of the American city, with special emphasis on Chicago, New York, and Boston. The course also investigates the effects of physical planning, especially urban renewal and the recycling of older buildings.

27.183 Seminar in Modern Art and Architecture 4 Q.H.

(Prereq. One course in post-Renaissance art history)

The course focuses on selected topics in modern art and architecture.

27.186 Documentary Film 4 Q.H.*

The course offers a study of the aesthetics and tradition of the documentary film, with a major emphasis on contemporary directions.

27.189 Basic Photography I (Formerly Photography) 4 Q.H.*

The course is intended to acquaint the beginning student with the use of the camera, the negative, and the print. Weekly shooting assignments, demonstrations, and hands-on lab experience are part of this active, primary-level course.

27.190 Filmmaking Workshop 4 Q.H.

This is an introductory course in the creative use of the film medium. Emphasis will be placed on weekly lab assignments designed to develop skills in the fundamental techniques of filmmaking. A final film project expressing an original idea in film form will be required of each student. Film screenings, lectures, and critiques. Equipment will be provided by the department.

27.191 Renaissance Art and Architecture 4 Q.H.

The course focuses on Italian painting, sculpture, and architecture of the fifteenth and sixteenth centuries, with special reference to the historical and social forces that shaped them.

27.193 Arts of the Old West 4 Q.H.

The course offers a survey of the arts of the early settlers of the American West, including Indians and frontiersmen, revealed through the buildings, painting, photography, and films of the Old West.

27.194 Intermediate Drawing (Formerly Life Drawing) 4 Q.H.

The main focus of this course is to heighten the student's understanding of spatial awareness, scale movement, and expression. Students will be asked to create unusual environmental situations for their figurative compositions. A variety of media will be used, including wash, pen and ink, watercolor, chalk, charcoal, and pencil.

*Lab fee required.

27.195 Animation Workshop 4 Q.H.

An introductory course in the creative possibilities of the animated film. Weekly lab assignments and a final project will acquaint students with various animation techniques and the creative advantages of each. Film screenings, lectures, and critiques. Equipment supplied by the department. No lab fee.

27.197 Art and Society 4 Q.H.

The course offers an examination of the way in which societal forces and political ideologies are expressed in the visual arts, especially in painting and architecture. The course combines a broad overview of a few significant historical periods with a more focused concentration on the past two hundred years.

27.198 History of Film 4 Q.H.*

This course offers an introductory historical survey of the development of film as an art form from the late nineteenth-century handcolored silent films to the contemporary international movement. Lectures, screenings, and discussions.

27.199 Intermediate Photography Workshop**4 Q.H.***

(Prereq. 27.202 or equiv.)

Through close interaction with the teacher, students are asked to refine their technical skills and to make meaningful decisions about their relation to the world around them through the use of photography. Alternative processes such as infrared, toners, and large format will be demonstrated and used. Increased attention to contemporary trends in photography will be shown with frequent slide presentations. In short, a qualitative approach to substantive photography.

27.200 Contemporary Directions in Photography**4 Q.H.**

A slide/lecture course designed to acquaint the student with trends in twentieth-century photography. Photojournalism, documentary, commercial, and creative photography will be examined closely in relation to other communication media.

27.201 Architecture and the City 4 Q.H.

This course provides a selective examination of Western architecture in the context of the urban

environments that produced it. Special attention is paid to the cultural and social forces which shaped this architecture of the cities.

27.202 Basic Photography 2**4 Q.H.***

(Prereq. 27.189 or equiv.)

A continuation of 27.189 with more emphasis on combining personal aesthetic choices with refining darkroom skills. A final portfolio at the end of the course as well as weekly shooting assignments are required.

27.205 Introduction to Architectural Design**4 Q.H.**

An introduction to fundamental design principles and their application to the built environment. Lectures, two- and three-dimensional design projects, and field trips.

27.295, 27.296, 27.297 Junior-Senior Honors Program**(each) 4 Q.H.**

For prerequisites and other details, see the section on the Junior-Senior Honors Program on page 5.

27.291, 27.292, 27.293 Directed Study**(each) 4 Q.H.**

These courses offer independent work under the direction of members of the Department on a chosen topic. Limited to qualified junior and senior students majoring in art history, with approval of the Department.

93.159 Introduction to Art, Drama, and Music**4 Q.H.**

An introduction to the basic formal language of music, drama, and the visual arts. The course focuses on such formal elements as space, time, structure, color, and interval by showing how these formal elements are, in effect, the "language" of the arts, and how they render intelligible a given art form. Lectures, discussions, and visits to museums and performances.

93.165 Humanistic Themes in the Arts**4 Q.H.**

An examination of the way in which certain humanistic themes and topics have been interpreted through music, drama, and the visual arts. The themes included are "The Arts and Identity" and "The Arts and A View of the World," with focus on such topics as "The Arts as Social and Political Commentary." Lectures, discussions, and visits to museums and performances.

Music

28.100 Music I 4 Q.H.

This course offers an introduction to selected works of our musical heritage from earliest to contemporary styles. It is primarily a survey and

listening course, with emphasis on styles, basic theory, forms, and the historical, social, and artistic periods which these works represent.

*Lab fee required.

28.102 Learning to Read and Write Music**4 Q.H.**

This is a basic course for those who want to learn how to read a score or how to write a tune. Students have the opportunity to learn to sight-read music and to compose in some of the basic forms (song, theme and variation, etc.)

28.105 Fundamentals of Music Theory**4 Q.H.**

This course offers the student the opportunity to learn simple melodic and rhythmic dictation skills; to recognize and build scales, intervals, and triads; and to sing at sight simple tonal melodies.

28.106 Theory I, Tonal Techniques A**4 Q.H.**

(Prereq. 28.105)

This course focuses on basic theoretical skills such as ear-training, sight-singing, and dictation. Also included are beginning studies in harmony and the analysis of music.

28.107 Theory II, Tonal Techniques B**4 Q.H.**

(Prereq. 28.106)

This course is a continuation of 28.106 and concentrates on intermediate levels of ear-training, sight-singing, and dictation. Additional work in harmony and analysis is undertaken.

28.108 Theory III, Tonal Techniques C**4 Q.H.**

(Prereq. 28.107)

This course is a continuation of 28.107 and includes principles of harmonization and modulation, realization of figured-bass, advanced ear-training, and two-part counterpoint. The student will also have the opportunity to undertake original composition.

28.109 Analysis of Musical Masterworks**4 Q.H.**

(Prereq. 28.108)

This course offers an analysis of a small number of musical masterpieces covering a diverse range of styles within the "Western" tradition. Aspects of phrasing, harmony, harmonic rhythm, orchestration and rhythm are analyzed.

28.110 Masterworks of Musical Literature II**4 Q.H.**

(Prereq. 28.109)

This course represents analytic techniques which can be applied to selected musical literature of the nineteenth and twentieth centuries. A small number of masterworks will be examined in detail, with attention given to the evolution of harmonic idioms and formal principles.

28.112 Music of the Baroque Era**4 Q.H.**

This course focuses on music of the seventeenth and early eighteenth centuries in Italy, Germany, France, and England. The emergence of important new genres (such as opera, sonata, and concerto) is discussed, and representative works of major composers (including Bach, Handel, Corelli, Vivaldi, Rameau, and Purcell) are examined.

28.115 Music of the Classical Era**4 Q.H.**

This course focuses on crucial developments in musical styles and forms of the late eighteenth century and on emerging genres, such as the symphony, the concerto, and the string quartet. Emphasis is placed on the vocal and instrumental works of Haydn and Mozart and on the early works of Beethoven.

28.117 Medieval and Renaissance Music**4 Q.H.**

This course offers an introduction to European music from the sixth through the sixteenth centuries. A wide variety of music is covered, ranging from the serene elegance of sacred Gregorian chant and the plaintive love songs of the Medieval troubadours to the lively dances and humanistic vocal music of the Renaissance. Representative works by composers such as Machaut, Landini, Josquin, Palestrina, and Dowland will be examined.

28.119 Music of the Avant-Garde**4 Q.H.**

Experimentation in music takes many forms. This course will cover a number of areas of contemporary music including new sound resources (both electronic and acoustic), new methods of organization in music, and the use of music in avant-garde film and theater.

28.120 Survey of Music History**4 Q.H.**

This course provides a chronological view of Western music, while examining the role of music in society and exploring the contributions of influential composers. Representative works from each period are discussed, including compositions by Machaut, Josquin, Bach, Handel, Mozart, Haydn, Beethoven, Berlioz, Wagner, Mahler, and Stravinsky.

28.123 Music of the Romantic Era**4 Q.H.**

This course focuses on romantic realism and idealism as expressed in the music of the nineteenth century. Emphasis is placed on historical, nationalistic, and literary influences. Composers studied include Beethoven, Schumann, Schubert, Berlioz, Liszt, Verdi, Wagner, Brahms, Tchaikovsky, and Mahler.

28.124 Traditional Folk Music of the Western World**4 Q.H.**

This course focuses on the folk music of Europe, Africa, North and South America, Asia, and Australia. Emphasis will be given to the ethnic music, dances, traditions, epics, and sagas that have influenced the Western and Eastern cultures.

28.125 Great Choral Literature**4 Q.H.**

This course provides an analysis of sacred and secular choral literature from medieval to contemporary times.

28.126 Music as a Means of Social Expression**4 Q.H.**

The course deals with the artist's involvement with recurring social themes of the human self-image, the search for peace and understanding, society's treatment of minority groups, and

sexual relationships. Painting and literary works are examined in addition to works by Beethoven, Schoenberg, Britten, and jazz composers.

28.128 Post-Romanticism in Music 4 Q.H.

This course focuses on music of the late nineteenth and early twentieth centuries, a time in which music reached a high level of emotional intensity. Representative works of composers such as Mahler, Bruckner, Schoenberg, Berg, and Strauss are examined.

28.135 Music of the U.S.A. 4 Q.H.

This course examines American music from the time of Purim psalm singing to the present. A wide variety of music will be covered, including concert music, traditional folk music, jazz, and contemporary styles.

28.136 Music in Popular Culture 4 Q.H.

This course deals with the nature of music composed for the mass market. Techniques of recording and merchandising music are discussed, and selected songs are analyzed for their musical content. The evolution of various styles will be traced, including ragtime, jazz, blues, and rock.

28.138 Nationalism in Music 4 Q.H.

This course focuses on music written in affirmation of national identity. Many of the works to be studied incorporate folk elements of the composer's culture. Among the composers to be studied are Rimsky-Korsakov, Dvorak, Sibelius, Grieg, Bartok, and Ives.

28.140 Mozart 4 Q.H.

Mozart's musical development from child prodigy to mature artist is traced from personal letters and biographies. Many of his major compositions, including symphonies, concertos, operas, and chamber works, are analyzed.

28.141 Twentieth-Century Music: Debussy to Schoenberg 4 Q.H.

This course focuses on developments in music from 1900 to mid-century. Topics include impressionism, expressionism, neo-classicism, and other major trends in music of the twentieth century.

28.142 Stravinsky 4 Q.H.

This course focuses on the life and works of Igor Stravinsky, the man who has been perhaps the most influential of all twentieth-century composers. Important works (such as *The Rite of Spring*, *Symphony of Psalms*, *The Rake's Progress*, and *Agon*) will be selected from each of his major stylistic periods, and his contributions to twentieth-century musical style will be assessed.

28.144 Debussy and the Music of Paris 4 Q.H.

Claude Debussy, impressionist in sound, composed music that marked a turning point toward modern trends. This course covers much of his music for piano, orchestra, and voices,

including *Suite Pour le Piano*, *Suite Bergamasque*, *Images* (for piano and for orchestra), *Nocturnes*, *La Mer*, and *Pelléas et Mélisande*. The music of Satie, Ravel, and Fauré, as it relates to that of Debussy, will also be discussed.

28.145 Beethoven 4 Q.H.

This course analyzes the complex personality and art of Beethoven, his relation to the turbulent times in which he lived, and his role in classical and romantic music.

28.147 Music of the Middle East 4 Q.H.

This course is an introduction to the music of selected Near Eastern and Arab cultures, such as Persian in the East and Ethiopic and Berber in Africa, as well as the traditional instruments of the areas. The cantillation styles and practices of various chants of the Hebrew, Christian, and Islamic traditions are also included.

28.148 Rock Music 4 Q.H.

This course focuses on the history of rock music from its origin in American blues and other styles through the popular music of the 1950s, the political styles of the 1960s, and the diverse trends of the 1970s. Major emphasis is placed on the formative years of rock. Students may be required to attend rock performances in the Boston area.

28.150 Music in Concert 4 Q.H.

This music appreciation course is designed to increase the listener's aesthetic development. Students have the opportunity to develop musical understanding through the study of music that is performed today in concerts by major symphony orchestras in the U.S. and throughout the world. Study materials are selected from actual symphony concert programs and include critical and analytical comments by some of the foremost critics and scholars. To make this course accessible to the uninitiated listener, the course is conducted in nontechnical language.

28.160 The Symphony 4 Q.H.

This course offers a study of the symphony as a major genre in the classical, romantic, and contemporary periods. Works by Haydn, Mozart, Beethoven, Schumann, Tchaikovsky, Brahms, Sibelius, Prokofiev, and others are studied.

28.162 Piano Music: The Great Composers and Performers 4 Q.H.

This course will give students the opportunity to hear and analyze some of the greatest works written for the piano performed by some of the world's greatest performers. In addition to recordings by internationally acclaimed artists, several live performances by guest artists from the Boston area and the Northeastern University Music Department will be presented in class. Students will be expected to attend and write a

review of one outside concert in addition to reviewing in-class performances.

28.163 Music and Poetry 4 Q.H.

This course will examine the art of setting words to music. It will confront the aesthetic problems encountered in a synthesis of two different art forms. That synthesis will then be examined in selected songs, choral works, tone poems, and operas of diverse periods and styles (classical, folk, and popular). Guest lecturers on various aspects of literature will be incorporated into the course.

28.164 Historical Instruments Workshop 4 Q.H.

This course is for those who wish to learn to play a medieval, Renaissance, or baroque instrument. In addition to teaching basic skills on instruments such as recorder, flute, crumhorn, viola da gamba, vielle, cornetto, and harpsichord, the course will provide opportunities for developing proficiency in music reading and ensemble playing.

28.165 The Music Industry 4 Q.H.

This course will examine business-related areas of the music industry. Included will be topics such as the make-up and structure of the record industry and music publishing world, the function of performing rights organizations (ASCAP and BMI), and the role of concert and orchestral managers. Guests from the various fields will be invited to lecture in class, and trips to "behind the scenes" locations will be arranged.

28.166 Women in Music 4 Q.H.

This course examines the multi-faceted role of women in music from the Renaissance through to the present. For centuries women have been active and influential patrons, composers, teachers, conductors, and performers in Europe and America. Their contributions to classical and popular music and to jazz will be examined, with emphasis on such widely varying figures as Queen Elizabeth I, Elizabeth Jacquet de la Guerre, Fanny Mendelssohn Hensel, Clara Schumann, Mrs. H. H. A. Beach, Germaine Tailleferre, Billie Holiday, Carla Bley, Ruth Crawford Seeger, Pauline Oliveiros, Sarah Caldwell, Antonia Brico, and Nadia Boulanger.

28.167 Music of Africa 4 Q.H.

The music of Africa is as varied as that continent's many linguistic and tribal identities. This course will provide a broad survey of the musical traditions of Africa with respect to their historical, social, and cultural background, as well as an approach to musical organization, musical practice, and significant aspects of style. These will all be discussed in light of possible contributions to contemporary African-American music.

28.180 Introduction to Opera 4 Q.H.

This course offers an analysis of opera as a dramatic form. Aria, recitative, ensemble, and

other basic elements of opera are isolated and discussed. Numbers opera, music drama, and singspiel are some of the types of opera considered. Composers whose works are analyzed include Mozart, Wagner, Verdi, and Puccini.

28.181 Contemporary Opera 4 Q.H.

Most major composers of the twentieth century, including Schoenberg, Berg, Bartok, Stravinsky, Hindemith, and Poulenc, have contributed to the opera repertory. Among the diverse works to be studied are: *Wozzeck*, *The Rake's Progress*, *Dialogue of the Carmelites*, and *Bluebeard's Castle*.

28.182 Wagner's Ring Cycle 4 Q.H.

This course offers an in-depth study of Wagner's cycle of music-dramas: *Das Rheingold*, *Die Walküre*, *Siegfried*, and *Götterdämmerung*. Wagner's compositional techniques (e.g., the use of leitmotif and musical metaphor) are examined in detail.

28.200 Jazz 4 Q.H.

The course focuses on jazz from its origins in New Orleans to the avant-garde experiments of today. The rhythmic, harmonic, instrumental, and stylistic characteristics of jazz are analyzed. Attention is given to the works of creative jazz artists such as Armstrong, Belderbecke, Parker, Ellington, and Coltrane.

28.201 The New Jazz 4 Q.H.

The course offers an in-depth study of various recorded works of important jazz performers/composers with respect to their works as creative artists: Armstrong, Belderbecke, Ellington, Coltrane, Miles Davis, etc. The study is not chronological but deals rather with the dynamics of artistic growth and change. Special attention is given to the developments of the last decade.

28.202 Black Artists in Music 4 Q.H.

The course offers a study of the contributions of black composers and performers to the world of music.

28.230 Musical Performance I 1 Q.H.
(Prereq. Audition or permission of instructor)

The course includes participation in rehearsals and public performances and/or research, composition, arranging, conducting, solo and ensemble activity, etc., with the Chamber Orchestra, the Early Music Players, the N.U. Chorus, the N.U. Bands, or other ensembles, under the supervision and coaching of a faculty member of the Music Department. The student's progress will be evaluated at the end of the quarter by audition or otherwise.

28.231 Musical Performance II 1 Q.H.
Continuation of 28.230.

28.232 Musical Performance III 1 Q.H.
Continuation of 28.231.

28.233 Musical Performance IV 1 Q.H.
Continuation of 28.232.

28.240 Piano Class I**4 Q.H.**

This is an introductory course in piano designed for adults who may have had no previous study in music. The course combines learning to read music with improvisation and accompaniment of simple tunes. Some theory is introduced to clarify the structure of pieces studied in class.

28.241 Piano Class II**4 Q.H.**

(Prereq. 28.240)

This course is a continuation of the skills developed in Piano I, with emphasis on increasing students' flexibility at the keyboard through study of scales, transposition, and modulation. Repertoire includes works by Bach, Bartok, and the Beatles.

28.242 Piano Class III**4 Q.H.**

(Prereq. 28.241)

This course will give students the opportunity to develop further facility acquired in Piano I and II through the study of more advanced works in the piano repertoire.

28.250 Music as a Listening Experience**4 Q.H.**

This introduction-to-music course is listening oriented and has been designed to provide tools for the aural appreciation of music. No previous musical knowledge is required or assumed, and studies deal directly with compositions selected from the masterpieces of music. Organized according to the tenets of PSI (Personalized System of Instruction), the course allows the student to proceed at his or her own pace under the constant guidance and supervision of the instructor. Grades are determined by the number of units completed, and peer-tutor assistance is provided.

28.261 Music Therapy**4 Q.H.**

The course examines the application of music as a therapeutic vehicle to release suppressed emotions, to encourage self-expression in psychiatric patients, and to treat a wide variety of disorders. Music therapy, in a modern approach to health services, is currently being considered as a supplement to shock and other treatments.

28.262 Music Therapy II**4 Q.H.**

(Prereq. 28.261)

The course examines the etiologies, characteristics, and applications of music therapy with

the physically handicapped, hearing impaired, visually impaired, learning disabled, emotionally disturbed, speech/language impaired, and geriatric populations in one-to-one and group settings. In addition, improvisations and appropriate music materials for the non-musician and adapted instrument designs tailored to each disability are studied, while the correlation of music and movement is explored. Comparison of MT approaches (Bony, Levin, Nordoff, Robbins, et al.), contributions of Orff, Kodaly, and Dalcroze, and discussion of assessment and accountability are included. Field trips to MT sites in and around Boston will be undertaken.

28.277 Voice Class I**4 Q.H.**

Students will have the opportunity to learn the basic vocal production required for fine singing. Repertoire, both classical and contemporary, will be chosen for each student to learn and perform in lessons and before the entire class. Lectures will be given on the following subjects: diction, the physiology of singing, resonance, registers, and interpretation. Students will also study the basics of music reading and sight-singing. Some interpretation will be discussed, and recordings of the greatest vocal artists will be played for class analysis.

28.290 Directed Study**4 Q.H.**

The focus of this course is independent work in a selected music area under the direction of one member of the Department. Enrollment is limited to qualified students only by special arrangement with the supervising faculty member and with the approval of the Department chairman.

93.160 American Musical Theatre**4 Q.H.**

This interdisciplinary course, offered by the departments of Drama and Music, traces the development of the American musical from *The Black Crook* to *A Chorus Line*. The role of musical theatre, as both entertainment and serious art form, is considered through an examination of script, score, dance, and design. Works by Bernstein, Rodgers and Hammerstein, the Gershwins, Weill, Lerner and Loewe, and Cole Porter are studied.

Drama

Note: See Modern Languages, 37.—, for courses in Speech Communication (formerly 29.—).

29.109 Speech for the Theatre**4 Q.H.**

(Prereq. 37.110)

The course focuses on special speech problems confronting actors performing in classical and contemporary theatre.

29.120 Introduction to Theatre Arts**4 Q.H.**

(For non-drama majors)

The course provides a brief view of the historical development of acting, directing, and production design. Emphasis is on appreciation of contemporary theatrical forms.

29.121 Theatre Appreciation 4 Q.H.

The course presents an introduction to the drama as a dynamic medium of human expression and to historical development of the theatrical form. Included are reading and analysis of selected plays as they relate to form, genre, and style from the viewpoints of audience and artist.

29.122 Theatre Experience 4 Q.H.

The course offers an introduction to the theatre as a collaborative art form (theoretical and practical), with an emphasis upon acting, directing, designing, lighting, and the necessities of theatre economics.

29.124 Reader's Theatre 4 Q.H.

A study of the skills necessary to adapt, direct, and perform short stories and novels for public presentation, including how to select and work with materials for either educational and/or entertainment purposes.

29.130 Stage Makeup 4 Q.H.

The principles of, the reasons for, and the materials used in makeup for the theatre, television, and films. The practical application of types and styles of makeup—straight, old-age, character, and corrective—is also included.

29.135 Twentieth-Century European Theatre 4 Q.H.

The work of major European directors and designers who have attempted to develop viable alternatives to nineteenth-century realism. Exploration of the ideas and productions of such persons as Meyerhold, Brecht, Artaud, Grotowski, Vakhtangov, Piscator, Brook, Svoboda.

29.136 The Theatre of Expanding Consciousness 4 Q.H.

The avant-garde theatre and its background in other arts as well as in society. The historical development of the avant-garde and some of its major themes are explored. An attempt is made to provide the student with the necessary background for discovering enjoyment and meaning in today's emerging theatre.

29.137 Image of Women in Western Drama 4 Q.H.

What is a woman? An examination of the way Western society, from the Greeks to the present day, has answered that question as revealed in its drama.

29.150 Acting I 4 Q.H.
(Prereq. Drama major or permission of instructor)

Fundamental techniques of stage use. The actor and the stage environment. Improvisations for strengthening imagination and increasing freedom. Analysis of scripts for work on performed scenes.

29.151 Acting II 4 Q.H.
(Prereq. 29.150)

Fundamental analysis of the script, including physicalizations and vocal scoring; character analysis; scenes performed for classroom analysis.

29.152 Acting III 4 Q.H.
(Prereq. 29.151)

Further development of the actor's tools, script and character scoring, exercises for physical and psychological freedom. In-class scenes from works in progress are included.

29.154 Rehearsal and Performance 4 Q.H.

Designed to allow the students to rehearse, perform, and produce a series of short dramatic works in which a variety of scripts and acting and directing concepts are explored under faculty guidance.

29.156 Body Movement I 4 Q.H.
(Prereq. Drama major or permission of instructor)

Students begin with simple Esalen physical awareness exercises, explore the warm-up process, and then try to find which exercises serve them best. Simple theatre games (i.e., machines, transformations, activity improvisations) are introduced, and students have the opportunity to learn how to relax through concentration on a specific mental task.

29.159 Theatre Games 4 Q.H.

This course offers a variety of basic dramatic, movement, and improvisational techniques that can be applied to theatrical, educational, and personal situations. Previous theatrical experience is not necessary.

29.160 Concepts of Direction 4 Q.H.
(Prereq. Drama major or permission of instructor)

Theories of dramatic presentation through analysis of selected historical developments. Purposes and techniques of theatrical direction as they relate to script analysis, production style, pictorial composition, rhythmic evolution, and empathic responses.

29.161 Problems In Direction 4 Q.H.
(Prereq. 29.160)

Experimentation in theory related to the staging of classical and modern drama. Analysis of plays in actual production: casting, rehearsals, character interpretations. Each student is responsible for the production of a one-act play.

29.164, 29.165, 29.166, 29.167 Practicum In Play Production (each) 1 Q.H.

Laboratory practice in technical theatre: scene building and painting; performing backstage functions. To be repeated for credit, up to four credits.

29.170 Stagecraft 4 Q.H.
Principles that underlie the coordination and execution of scenery for the stage; examination

of different kinds of scenery, tools, equipment, construction materials, and techniques; handling of scenery and basic scene painting. Laboratory work: constructing and painting scenery for University productions.

29.172 Scenic Design for the Stage 4 Q.H.
(Prereq. 29.170)

Practical problems of scene design and methods of approach. Classwork and projects in analyzing a script in terms of visual requirements; elements of design and their applications to scenery; methods of inspiration; presentation of ideas including sketches, rendering, models, working drawings, and elevations; evaluation of designs. Laboratory work includes executing scenery for University productions.

29.173 Lighting Design for the Stage 4 Q.H.
(Prereq. 29.170)

Basic principles and practices of stage lighting, including the qualities and functions of light, lighting instruments and controls, basic electricity, color in light, and analysis of the script in terms of light requirements. Students are expected to develop light plots and schedules for various kinds of stage productions. Classwork includes laboratory work on lighting crews for University productions.

29.174 Scene Painting 4 Q.H.

The history of scene painting and ornament from classical to contemporary times. Studio organization, color, color theory, equipment, tools, materials, and costs involved with painting stage scenery. Projects and exercises in the use of different media, matching colors, painting of textures, light and shade, and the use of stencils and physical textures. Laboratory sessions include painting stage scenery for University productions.

29.175 Costuming I 4 Q.H.

The course presents the basic principles and ideals of costuming for the stage. Costume history is covered from prehistoric times through the Renaissance. Projects relate to historic periods covered.

29.176 Costuming II 4 Q.H.
(Prereq. 29.175 or permission of instructor)

A continuation of Costuming I. Lectures on costume history cover the seventeenth century through the early twentieth century. Projects relate both to the historic periods covered and to such theatrical forms as drama, ballet, opera, and musical comedy.

29.177 Basics of Theatre Design and Style 4 Q.H.

Visual style and ornamentation for the director, actor, designer, and audience. Examination is made of the script in terms of visual presentation. Work with the basics of design in relation to theatre and stage picture created by direction

and design. Emphasis is on two-dimensional techniques of presentation based on psychology of color, line, and form and their effects on an audience. Graphic projects applying various media and techniques to achieve effect or style are included.

29.178 Theatre Crafts 4 Q.H.

An exploration of special effects and materials used for the theatre. Puppetry construction and staging. Building handprops, masks, and wigs.

29.179 Pattern Drafting and Costume Construction 4 Q.H.

Introduction to basic skills in simple pattern drafting and construction of basic garments. Lab work provides students an opportunity to acquire the knowledge and skills with which to design and adjust simple garments. Specifically designed for non-skilled beginners.

29.180 Playwriting I 4 Q.H.

The principles and practices of modern dramatic composition: characterization, plot, plot structure, dialogue, and other dramaturgical elements as seen in the one-act play. Included are the writing of brief scenes, the dramatic composition, and the one-act play.

29.181 Playwriting II 4 Q.H.
(Prereq. 29.180)

Continuation of 29.180.

29.182 Puppetry 4 Q.H.

A theoretical and practical survey of the art of puppetry. Utilizing a lecture/laboratory format, the history of puppetry is examined from prehistoric times through the present, and construction techniques for various styles of puppets are demonstrated and applied. The course covers shadow, hand, rod, hand-and-rod, bib, scarf, and marionette puppets.

29.185 Children's Theatre 4 Q.H.

Theories and methods of creative techniques related to children's programs in schools, churches, and recreational facilities. Analysis of literature in preparation for production of children's plays.

29.186 Educational Theatre 4 Q.H.

Drama and drama activities in community, social, health, and educational agencies. Organizing and directing young people's theatre programs are included.

29.200 Theatre History I 4 Q.H.

Development of the theatre and the drama of Greece and Rome, medieval Europe, Elizabethan and Restoration England, and seventeenth-century France; an examination of playwriting, acting styles, scene design, theatre architecture, and the relation among these elements.

29.201 Theatre History II 4 Q.H.

Development of the European theatre of the eighteenth, nineteenth, and twentieth centuries; growth and development of the proscenium

theatre; the emphasis upon naturalistic and realistic presentation; and theatre innovations.

29.203 The Theatre of Ibsen, Strindberg, and Chekhov 4 Q.H.

Intensive study of the theatre of the three great masters of the naturalistic movement in Europe, whose works stand as the foundation of modern drama.

29.205 The Restoration Theatre 4 Q.H.

The philosophical, social, historical, and critical influences upon the Restoration theatre and its dramatists.

29.207 New Trends in American Theatre 4 Q.H.

A survey of the evolution of theatre and drama in America during the 1960s and '70s. Developments in the commercial, the nonprofit, and the experimental fields will be examined.

29.208 The Irish Theatre 4 Q.H.

The course focuses on theatre and drama in Ireland from their beginnings to the present, with the backgrounds of Irish folklore and history. Particular emphasis on developments in the twentieth century.

29.210 The American Theatre 4 Q.H.

The course focuses on the American theatre from the Revolutionary War to the present.

29.211 The Theatre of Williams, Miller, and Albee 4 Q.H.

The course offers an intensive study of the works of three major post-World War II American playwrights.

29.212 Black Theatre in America 4 Q.H.

The course surveys the history of black theatre artists in America from the time of Ira Aldridge to the present day. Also examines the works of black playwrights from the Harlem Renaissance to the present, with an emphasis on the period beginning with Baraka's *Dutchman*.

29.213 Sexuality in the Drama 4 Q.H.

The course examines sexuality, homosexuality, deviant social behavior, and the trends toward and away from pornography in selected plays from Greek to contemporary theatre. Literary, critical, theatrical, and historical analysis.

29.214 Stage Management 4 Q.H.

The course examines the fundamental techniques of stage management in educational, community, and professional theatres and the working relations between stage managers and directing, acting, and technical personnel. The course includes the study of practical concepts of organizing and running performances, and a discussion of the philosophy of the stage manager as a collaborative artist and crafts-person.

29.215 Stage Mechanics 4 Q.H.
(Prereq. 29.170)

This is a course in theatrical construction problem solving. Through a series of construction and material problems, the course

focuses on advanced building and structuring techniques, materials, and organizational skills. A final project and presentation are required.

29.216 Period Scene Design 4 Q.H.
(Prereq. 29.172)

This course exposes students with some design experience to historic styles of architecture, interior design, and furniture. This knowledge is applied through theatrical design projects in specific historic periods and research projects on interior design styles.

29.217 Theatrical Drafting 4 Q.H.

By working on supervised classroom projects, the student is exposed to the basic graphic language needed to translate a designer's ideas into technical drawings used for construction. These basic skills can be used for future course work in design, University productions, and professional work.

29.218 Research for Theatrical Production 4 Q.H.

This course is an introduction to the background resources used in preparing theatrical production of both period and contemporary plays. The course covers means of using libraries, museums, and special collections to discover information about a play's historical context, the period in which it is set, major views of the text, and approaches employed in significant earlier productions.

29.230 Contemporary Theatre 4 Q.H.

The course examines the various forces that have shaped the major trends in Western theatre over the past two decades with emphasis upon selected works and contributions of Brecht, Bolt, Miller, Wilder, Baraka, Bullins, Horowitz, the major absurdist, and current experimentalists; examination of contemporary theatrical concerns with nudity, obscenity, homosexuality, and the special economic and artistic formulators of contemporary plays.

29.231 The Theatre of the Absurd 4 Q.H.

The course focuses on the theatre of the absurd as an anti-literary reflection of and reaction to life; its effects upon Western drama. Major concerns with selected works and ideas of Jarry, Artaud, Camus, Sartre, Beckett, Genet, Ionesco, Pinter, Kopit, Brown, and Arrabal.

29.232 The Comic Theatre 4 Q.H.

The course focuses on the comic theatre from its beginnings in the ancient Greek theatre to its performances in contemporary theatre; an examination of the comic playwright, the comic actor, the comic director—the synthesizing of the arts of the theatre to produce thoughtful as well as titillating laughter. Included are study of scripts by such playwrights as Aristophanes, Molière, Shaw, Neil Simon; techniques of Charlie Chaplin, the Marx Brothers, stand-up comics.

Directional devices will be examined through lecture, film, records, and attendance at live performances.

29.233 Elizabethan Acting Styles 4 Q.H.
(Prereq. 29.151)

Through scene study and research involving notable production concepts, this course deals with Shakespeare's work and also handles other Elizabethan and Stuart dramatists. The course is structured as a problem-identification, problem-solving exercise.

29.234 Restoration and Eighteenth-Century Acting Styles 4 Q.H.
(Prereq. 29.151)

Problems encountered in plays of the Restoration and the eighteenth century are examined using various techniques including scene study.

29.235 Acting Styles for Twentieth-Century Nonrealistic Theatre 4 Q.H.
(Prereq. 29.151)

The plays of Beckett, Genet, Ionesco, Brecht, Albee, and others are examined specifically in light of the acting problems encountered by actors trained in an essentially naturalistic mode.

29.236 Special Topics in Acting and Directing 4 Q.H.

An in-depth examination of a subject of particular significance to the field.

29.237 Special Topics in Theatrical Design 4 Q.H.

An in-depth examination of a subject of particular significance to the field.

29.238 Special Topics in Theatre History—Dramatic Criticism 4 Q.H.

An in-depth examination of a subject of particular significance to the field

29.240 Drama Theory/Criticism 4 Q.H.

An examination of both the major historical statements of drama theory and contemporary drama criticism as evidenced in journalistic play reviews. Students are required to prepare reviews of local productions.

29.256 Body Movement II 4 Q.H.
(Prereq. 29.156)

The concentration-relaxation work is carried on in a more specific manner leading to an understanding of Michael Chekov's technique

using body centers. Theatre games are also explored in more depth.

29.270 Theatre Management 4 Q.H.

Theatre management, including problems of financing, promoting, and programming for educational, community, profit, and nonprofit professional theatre.

29.280 Senior Project in Drama 4 Q.H.
(Prereq. Drama majors only)

The student, working closely with an advisor, has the opportunity to develop a project that integrates the work pursued to date, and demonstrate his/her capacity to enter the professional theatre or to pursue graduate studies.

29.285 Drama and Movement Therapy 4 Q.H.

An exploration of teaching and rehabilitative methods, using the techniques of creative dramatics and dance/movement therapy. An emphasis will be placed on the exceptional child and on the physically and emotionally handicapped.

29.286 Rehabilitative and Theatrical Makeup 4 Q.H.

Use and application of makeup for corrective and rehabilitative purposes as well as for stage purposes. Special emphasis is on techniques utilized to enable physically deformed individuals to achieve a facial impression of the aesthetically normal and societally acceptable. For those interested in stage impressions, emphasis on three-dimensional constructions, prosthesis with latex, beards and moustaches.

29.290, 29.291, 29.292, 29.293
Directed Study (each) 4 Q.H.

29.295, 29.296, 29.297, 29.298 Junior-Senior Honors Program (each) 4 Q.H.

For prerequisites and other details, see the section on the Junior-Senior Honors Program page 5.

93.160 American Musical Theatre 4 Q.H.

An interdisciplinary course, offered by the departments of Drama and Music, in the development of the American musical as entertainment and serious art form, through an examination of script, score, dance, and design. Works by Bernstein, Rodgers and Hammerstein, the Gershwins, Weill, Lerner and Loewe, and Cole Porter are examined.

English

Prerequisite for all English courses is a minimum of Freshman English courses (30.113 and 30.114) or equivalent. Please consult the English Department catalogue for more information on all courses listed. Topic courses change quarter to quarter.

30.100 Intensive English as a Second Language

Intensive review of English grammar to help students develop listening, speaking, reading, writing, and studying skills in the classroom, language laboratory, and small-group tutorials.

30.101 Fundamentals of English I 4 Q.H.

(Prereq. Special placement)

The course offers an introduction to principles of effective expository writing; emphasis on description, paragraph construction, and organization; review of the conventions of English usage, punctuation, and syntax; essay assignments.

30.102 Fundamentals of English II 4 Q.H.

(Prereq. 30.101)

Focus on exposition, argument, and academic essay writing; instruction in writing a research paper; continued emphasis on the conventions of English usage, punctuation, and syntax; essay assignments.

30.103 Grammar for Journalists 4 Q.H.

(Prereq. Journalism majors only)

Reviews the mechanics of newspaper and magazine prose; emphasis is on grammatical forms, punctuation, spelling, effective structures, and conventional usage; exercises and essay assignments.

30.104 Intermediate Writing 4 Q.H.

Provides writing instruction for students who wish to improve their writing skills; opportunity for students to develop their particular interests in subject matter and form.

30.105 Fundamentals of English for Non-native Speakers 4 Q.H.

(Prereq. Special placement)

Advances students' English language proficiency through reading comprehension drills, vocabulary development, oral presentations, and intensive practice, including grammar and mechanics. Introduces such college study techniques as note taking and basic library skills.

30.106 English for International Students I 4 Q.H.

(Prereq. 30.105 or special placement)

Emphasizes the importance of clearly stating and supporting a thesis in organized paragraph form. Focuses on short prose readings as examples of descriptive, narrative, and expository techniques. Writing and rewriting of short weekly essays required.

30.107 English for International Students II 4 Q.H.

(Prereq. 30.106)

Introduces literature study through close reading and discussion of fiction, nonfiction,

and poetry. Continues development of rhetorical techniques by requiring weekly essays written in relation to the readings and rewritten to improve content, organization, and diction.

30.108 Creative Writing 4 Q.H.

Gives the beginning writer an opportunity to practice various forms of writing, both poetry and prose. Class discussion of student work.

30.110 Poetry 4 Q.H.

Extensive exercise in close reading of selected poems, study of critical terms, and practice in different critical approaches to poetry; examination of techniques for reading a variety of poetic texts; critical papers required.

30.111 Fiction 4 Q.H.

Close reading of selected novels and short stories, study of critical terms, practice in different critical approaches to fiction; critical papers required.

30.112 Drama 4 Q.H.

Close reading of selected plays, study of critical terms, practice in different critical approaches to drama; critical papers required.

30.113 Freshman Writing 4 Q.H.

The course focuses on the individual student's writing skills. Included are application of important principles of logic and rhetoric to exposition and argumentation; review of sentence structure, punctuation, and paragraphing; extensive reading and analysis of the essay form; theme assignments.

30.114 Introduction to Literature 4 Q.H.

An introduction to literary forms: poetry, prose fiction, and drama. Intensive reading of various forms and discussion of different approaches to literature. Students are required to write critical papers, and are expected to develop techniques of research and documentation.

30.115 Great Themes in Literature 4 Q.H.

Content determined by instructor, who chooses a theme and a number of illustrative works from different periods. Students are required to write critical papers, and are expected to develop techniques of research and documentation.

30.117 Topics in Fiction 4 Q.H.

Studies a particular kind of fiction, such as the novella; a problem in fiction, such as the role of the narrator; a particular group of fiction writers; or a theme in fiction.

30.118 Topics in Drama 4 Q.H.

Studies a particular kind of drama, such as comedy or tragedy; a problem in drama; a particular group of dramatists; or a theme in drama.

30.119 Topics in Poetry**4 Q.H.**

Studies a particular kind of poetry, such as the sonnet or the dramatic monologue; a problem in poetry; a particular group of poets, such as the confessional poets; or a theme in poetry.

30.120 Introduction to Linguistics**4 Q.H.**

Background in current linguistics. Diverse topics include the nature and origin of language, animal communication systems, prescriptive and descriptive grammar, language change, dialects, and language in literature. Reviews modern concepts of language structure: phonology, morphology, syntax, and semantics.

30.121 Foundations of the English Language**4 Q.H.**

Studies the development of modern English from Anglo-Saxon beginnings; effects of Scandinavian and Norman invasions; dialect geography; evolutionary changes, word formation and borrowing; origins of writing and problems of spelling. Readings include both formal and informal writings, literary selections, wills, journals, and private and public letters.

30.122 Topics in Genre**4 Q.H.**

Studies several genres concurrently; or studies, cross-generically, literary modes such as satire, pastoral, or melodrama; or studies a theme in a number of different genres.

30.125 Grammars of English**4 Q.H.**

Designed for students seeking comprehensive knowledge of English grammar, this course provides a study of structure and usage in English according to traditional, descriptive, and generative (transformational) approaches.

30.126 Transformational Grammar**4 Q.H.**

The theories of generative-transformational grammars by Noam Chomsky and others. The opportunity to develop the skill with which to construct and operate specific generative-transformational grammars.

30.130 Introduction to Semantics**4 Q.H.**

The relation between language and behavior, levels of abstraction in communication, habits of evaluation of linguistic phenomena, and the modification of such habits in the direction of human understanding and survival.

30.131 Topics in Linguistics**4 Q.H.**

Examines closely such topics as the application of linguistics to the study of literature, problems in semantics (e.g., language in law, language and social class), or problems in American dialects.

30.141 Science Fiction**4 Q.H.**

The myths and rhetorical (scientific and pseudo-scientific), strategies of science fiction from Mary Shelley's *Frankenstein* through contemporary authors such as Vonnegut, Bradbury, Heinlein, and Clarke.

30.142 Psychology and the Novel**4 Q.H.**

Concentration on twentieth-century novels whose themes stress individual behavior and

motivation and whose form and style often try to imitate human mental and emotional processes. Includes novels by such writers as Kafka, Dostoevski, Faulkner, Conrad, and Lawrence.

30.146 Modern Bestseller**4 Q.H.**

Explores the function of quest, romance, and adventure in a selection of contemporary, bestseller fiction by such authors as Hailey, Robbins, and Irving Wallace.

30.147 Topics in Science Fiction**4 Q.H.**

Focuses on a single writer or group of writers (Wells or writers of contemporary American science fiction); a theme (women in science fiction or the future city); or a unifying idea (time travel or utopia/dystopia).

30.148 Sex Roles in Literature**4 Q.H.**

Investigates the relation between sex roles, male and female, and literary portrayals. Selections represent male and female writers and provide a culturally comparative perspective. Readings include novels, plays, autobiographies, short stories, poems, as well as critical materials.

30.151 The Modern Novel**4 Q.H.**

Studies the themes of important novelists of the twentieth century; analyzes styles, techniques, and trends in fiction; includes such authors as Joyce, Lawrence, Hemingway, Faulkner, and Bellow.

30.152 Modern Drama**4 Q.H.**

Studies the development of drama since the late nineteenth century as a function of realism, naturalism, symbolism, and surrealism.

30.154 The Modern Short Story**4 Q.H.**

The study of short-story writers with close attention to such figures as Poe, Joyce, Lawrence, Hemingway, and Oates.

30.155 Contemporary Fiction**4 Q.H.**

British and American writers from 1945 to the present, including such figures as Britain's Lessing, Burgess, Amis, and Powell; and America's Pynchon, Vonnegut, Oates, and Barth. Emphasis is on the experimental and modernist authors.

30.156 Fantasy**4 Q.H.**

Studies in the theory and practice of fantasy as found in the works of such authors as Swift, Carroll, Wells, and C. S. Lewis.

30.157 Topics in Fantasy**4 Q.H.**

Explores such areas as dreams, nightmares, and borderline states of consciousness in the works of such writers as Poe, Tolkien, and Kafka.

30.158 Literature in Context**4 Q.H.**

Attempts to place the writer in the context of a special theme. For example, the course might study a group of authors influenced by their common interest in psychoanalysis, by their social consciousness, or by an interest in the Wild West and the settlement of America.

- 30.159 Literature in Context** 4 Q.H.
Similar to 30.158 but with different texts and contexts in a given year.
- 30.160 Topics in Literature** 4 Q.H.
This course deals experimentally with subjects and themes such as heroes and villains, myth and folklore, fiction about war.
- 30.161 Topics in Literature** 4 Q.H.
Similar to 30.160 but with different topics in given year.
- 30.162 Major Figure** 4 Q.H.
Devoted entirely to the work of one writer. Specific writers vary widely and change frequently; for example, Mark Twain, Virginia Woolf, or Eugene O'Neill may be selected.
- 30.163 Major Figure** 4 Q.H.
Similar to 30.162, but with concentration on a different writer in a given year.
- 30.164 Business Tradition in Literature** 4 Q.H.
Examines the various literary images of the businessman as new frontier opportunities for the accumulation of wealth opened up. Biographies, autobiographies, novels, plays, and films are examined to study the many facets of these captains of industry and to determine their impact on society.
- 30.165 Literature and the Law** 4 Q.H.
This course uses literature to investigate the problems of crime and justice as they occur throughout time, from ancient Greek tragedies to modern American novels. The readings may help the student to discover the changing nature of the criminal—hero or victim or villain—and to deal with the social, psychological, and political facts that define him/her.
- 30.166 Urban Life and Literature** 4 Q.H.
This course examines the city in literature as it has been depicted from ancient times to the present. Such themes as the city as a locus of evil, the city as a place of possibility, and the city as a center of art and an influence on creative form are discussed. Works by Plato, Virgil, Juvenal, Addison, Fielding, Defoe, Balzac, Whitman, Melville, James, Howells, Crane, Joyce, Dreiser, Eliot, Dos Passos, West, Bellow, Malamud, and Barthelme, among others, may be included on the reading list. The purpose of the course is to provide the student an opportunity to discover how an interdisciplinary approach to literature can be used critically—and how the city is a cultural resource, a subject of wonder, and a constant concern in literature.
- 30.167 Literature and Politics** 4 Q.H.
Explores how authors from Sophocles to Mailer represent the religious, moral, and ethical conflicts arising from the acquisition, use, and misuse of political power. The literature falls into several categories: utopian, which

establishes a conflict between the ideal and the real; satirical, which threatens a power structure by exposing it to scorn; analytic, which describes the rise to and fall from power of individuals, parties, or states; and investigative, which takes the reader inside a power elite to observe its inner operations. The course examines the difference between the ideal of government and its reality.

30.168 The Literature of Science 4 Q.H.
Examines the literary methods used by scientists to involve us in their experiences and discoveries. Many of the most creative minds of science have left literary works full of clarity, vigor, and emotive power. Explores a variety of these works from antiquity to the present to see how the creativity of the scientist is fundamentally the same as the creativity of the literary artist. Readings will be drawn from astronomy, physics, natural history, biology, mathematics, and psychology.

30.169 Film and Literature 4 Q.H.*
This course explores the ways in which film can transform the written word to a visual experience, and illustrates the way in which cinematic techniques help create and extend the meaning of that visual experience. Weekly screening sessions give students the opportunity to pursue and develop cinematic interests evolving from class discussions.

30.170 Survey of English Literature I 4 Q.H.
Surveys the major British writers and major literary forms and works from the Middle Ages to the end of the eighteenth century. Works by such writers as Chaucer, Spenser, Shakespeare, Milton, Pope, and Swift will be read and discussed.

30.171 Survey of English Literature II 4 Q.H.
Surveys the major British writers and major literary forms and works from the romantic period (c. 1800) to the mid-twentieth century. Works by such writers as Wordsworth, Keats, Browning, Yeats, Lawrence, and Eliot will be read and discussed.

30.175 Contemporary American Literature 4 Q.H.
The course explores the major literary movements and developments in American poetry and fiction from the Second World War to the present. Works by such writers as Lowell, Roethke, Plath, Pynchon, Barthelme, and Vonnegut will be read and discussed.

30.178 Shakespeare on Film 4 Q.H.*
This course examines the various treatments of Shakespeare's plays on film. It is concerned with the technical aspects of film and how these are used by directors to transfer Shakespeare's plays from the stage to the screen.

30.180 Survey of American Literature I

Surveys the major American writers and major literary forms and works from the colonial period to the Civil War. Works by such writers as Taylor, Cooper, Poe, Hawthorne, Melville, and Emerson will be read and discussed.

30.181 Survey of American Literature II

Surveys the major American writers and major literary forms and works from the Civil War to the mid-twentieth century. Works by such writers as Whitman, Dickinson, Twain, James, Hemingway, Fitzgerald, and Faulkner will be read and discussed.

30.182 American Novels I**4 Q.H.**

Focuses intensively on the themes, forms, and techniques of the major American novelists of the nineteenth and early twentieth centuries, such as Cooper, Hawthorne, Melville, James, and Dreiser.

30.183 American Novels II**4 Q.H.**

The course focuses intensively on the themes, forms, and techniques of modern American novelists such as Hemingway, Fitzgerald, Steinbeck, and Faulkner.

30.185 Topics In Film**4 Q.H.***

The course focuses on a movie genre (e.g., the western, the gangster film, the thriller), on a movie personality (e.g., an actor, writer, director), or on a theme (e.g., women in the movies).

30.186 Early American Literature**4 Q.H.**

Examines American literature of the colonial and federal periods, including Bradford, Taylor, Edwards, Franklin, Irving, and Cooper.

30.187 New England Renaissance**4 Q.H.**

Studies the development of a native tradition in the context of democratic and romantic attitudes toward experience and the paradox these attitudes reveal. Works by such writers as Emerson, Thoreau, and Melville will be read and discussed.

30.189 American Realism**4 Q.H.**

Examines the realistic tradition in American literature, including local color and native humor, from the end of the Civil War to the turn of the century. Works by such writers as Twain, James, Howells, Crane, and Norris will be read and discussed.

30.190 Modern American Literature**4 Q.H.**

Explores the major literary movements and developments in American poetry and fiction from the turn of the century to the Second World War. Works by such writers as Anderson, Wharton, Fitzgerald, Faulkner, Frost, and Williams will be read and discussed.

30.191 Children's Literature**4 Q.H.**

Studies the history of children's literature in the English language, with special attention to matters such as genre theory and critical ap-

proaches. Such works as *Alice in Wonderland*, *Uncle Remus*, *Little Women*, and *The Wizard of Oz* will be read and discussed.

30.192 Topics In Children's Literature**4 Q.H.**

Focuses closely either on a specific collection of stories (e.g., *Grimm's Fairy Tales*), on a specific genre (e.g., boys' books), or on a problem of evil or children's literature (e.g., the opera, the western, the police story, etc.; on a of group socialization).

30.193 Popular Culture**4 Q.H.**

Surveys the development of popular culture in the United States as the living culture that arose in response to the development of a leisure-time market and the technology to reach it. The focus of the course is on the mass media, surveyed chronologically for evidence of trends arising from changes in popular taste and technology. Among the media to be discussed are popular literature, radio, and television.

30.194 Topics In Popular Culture**4 Q.H.**

The course focuses on such topics as the soap opera, the western, the police story, etc.; on a popular culture activity; or on a popular culture perspective.

30.195, 30.196 Freshman English for Honors Students**(each) 4 Q.H.**

(Prereq. Special placement)

Equivalent of 30.113 and 30.114 for Honors Program Freshmen. Meets during winter and spring terms so that both science and non-science majors in the Honors Program can enroll together. See English Department course listing under 30.113, 30.114 for description.

30.200 Technical Writing I**4 Q.H.**

This course is a composition elective to train writers for careers in technical writing. Course provides instruction in writing clear, unambiguous prose; describing processes; and researching published information through practice in writing memoranda, proposals, feasibility and program reports, and operation manuals.

30.201 Technical Writing II**4 Q.H.**

(Prereq. 30.200 or permission of instructor)

This is a course in technical writing for students who wish to develop skills in a particular subject or form.

30.202 Writing for the Computer Industry**4 Q.H.**

(Prereq. 30.200, or permission of instructor and one computer science course)

Focuses on computer documentation: general information, operating and programming instructions. Includes graphics, layout, testing, and revision.

30.203 Writing for the Professions:**Health Services****4 Q.H.**

This course is designed to serve the

*Lab fee required.

professional writing needs of students in the College of Nursing and the College of Pharmacy and Allied Health Professions through instruction in formal rhetoric and practice with a variety of professional forms: lab reports, clinical evaluations, medication analyses, and HEW proposals.

30.204 Advanced Writing 4 Q.H.

(Prereq. 30.104 or permission of instructor)

A composition elective for experienced writers who wish to hone their skills; opportunity for students to develop their particular interests of subject and form.

30.205 Writing for the Professions:

Business Administration

4 Q.H.

This course is designed to serve the professional writing needs of students in the College of Business Administration through instruction in formal rhetoric and practice with a variety of professional forms: letters, short memos, formal staff reports in the functional areas of accounting, personnel, marketing, finance, transportation, and insurance.

30.206 The Literature of Engineering 4 Q.H.

This course is designed to serve the professional writing needs of students in the College of Engineering through instruction in formal rhetoric and examination of a variety of professional forms: description, analytical reports, systems design, lab reports, and proposal specifications.

30.207 Writing for the Professions:

Criminal Justice

4 Q.H.

Designed to serve the professional writing needs of students in the College of Criminal Justice, this course offers instruction in formal rhetoric and practice with a variety of professional forms.

30.208 Poetry Workshop

4 Q.H.

(Prereq. 30.108 or permission of instructor)

This is an advanced workshop course in writing and examining original student poetry. Students are expected to experiment in some established poetic forms of their own choosing and to produce their own original work.

30.209 Fiction Workshop

4 Q.H.

(Prereq. 30.108 or permission of instructor)

This is an advanced workshop course in writing and examining original student fiction.

30.210 Major Early British Novelists

4 Q.H.

The course surveys the early English novel by such authors as Defoe, Fielding, Smollett, Sterne, and Austen. The novels will be read and discussed to determine themes and characteristics and to chart the development of the genre in the eighteenth century.

30.211 Major Nineteenth-Century

British Novelists

4 Q.H.

The course surveys the nineteenth-century English novel by such authors as the Brontës, Thackeray, Eliot, Meredith, and Hardy. The novels will be read and discussed to determine themes and characteristics and to chart the development of the genre in the nineteenth century.

30.212 Major Twentieth-Century British

Novelists

4 Q.H.

Surveys the twentieth-century English novel by such authors as Joyce, Lawrence, Woolf, and Durrell. The novels will be read and discussed with the goal of determining the characteristics and charting the development of the genre in the twentieth century.

30.213 English Drama I

4 Q.H.

Surveys representative English drama, excluding Shakespeare, from the Towneley Cycle to Sheridan. The dramas will be read and discussed to determine themes and characteristics and to chart the development of the genre from its origins in England to the end of the eighteenth century.

30.214 English Drama II

4 Q.H.

Surveys representative English drama of the nineteenth and twentieth centuries. The dramas will be read and discussed to determine themes and characteristics and to chart the development of the genre from the nineteenth century to the present.

30.215 Publication Arts

4 Q.H.

This course is designed to acquaint students with basic publishing skills. Each student can choose an area of specialization, such as fiction, medicine, law, or engineering in order to develop skill in editing manuscripts.

30.218 Medieval English Literature

4 Q.H.

Surveys the major works of medieval English literature. Works such as *Sir Gawain*, *Piers Plowman*, and *Pearl* will be read and discussed.

30.222 Chaucer

4 Q.H.

Surveys the work of Chaucer, with particular emphasis on *The Canterbury Tales*.

30.223 Topics in Chaucer

4 Q.H.

Examines closely a particular work or group of works (such as *Troilus and Cressida*) or a theme (such as Chaucer's symbolism).

30.225 Milton

4 Q.H.

Concentration on Milton's *Paradise Lost*, with supplementary readings in his minor poetry and prose.

30.227 Topics in Medieval Literature

4 Q.H.

The course focuses on such topics as a genre (e.g., romance or debate literature) or on a theme (e.g., alchemy or King Arthur).

30.228 Non-Fiction Workshop 4 Q.H.
(Prereq. 30.104 or 30.108 or permission of instructor)

This is an advanced workshop course in writing with focus on such forms as short essays, reviews, and profiles.

30.230 Seventeenth-Century English Literature 4 Q.H.

Examines major writers of the period, such as Bacon, Jonson, the metaphysical poets, Donne, Herbert, Dryden, and Milton.

30.231 Topics in Seventeenth-Century English Literature 4 Q.H.

This course examines closely either a single writer or group of writers (e.g., Dryden or the metaphysical poets) or a topic (e.g., the flourishing of satire).

30.236 Eighteenth-Century English Literature 4 Q.H.

Surveys the period; includes such major writers as Pope, Addison, Steele, Swift, Goldsmith, Burns, Johnson, and Boswell.

30.237 Topics in Eighteenth-Century Literature 4 Q.H.

Examines closely such topics as a single writer or group of writers (e.g., Swift or the essayists), a genre (e.g., satire), or a theme (e.g., reason and madness).

30.239 The Writing Process 4 Q.H.

This course is designed primarily to provide substantial experiential and scholarly training for undergraduate tutors in the English Department's Writing Center.

30.240 Romantic Poetry 4 Q.H.

Surveys the work of the major romantic poets: Blake, Wordsworth, Coleridge, Byron, Shelley, and Keats.

30.241 Victorian Literature 4 Q.H.

Surveys the major literature of the period, from the works of Tennyson, Arnold, and Dickens to the works of G. M. Hopkins, Wilde, and the early writing of G. B. Shaw and Conrad.

30.242 Topics in Romantic Poetry 4 Q.H.

This course examines closely a single writer or group of writers (e.g., the Keats-Shelley circles) or a theme (e.g., poetry and revolution or the creative process).

30.243 Topics in Victorian Literature 4 Q.H.

Examines closely a single writer or group of writers (e.g., Wilde or the fantasists) or a theme (e.g., the movement toward modernism or decadence).

30.244 World Literature I 4 Q.H.

Readings in world literature from the time of the Greeks through the Renaissance.

30.245 World Literature II 4 Q.H.

Readings in world literature from the Renaissance through the modern period.

30.246 Twentieth-Century English Literature 4 Q.H.

Surveys the major literature of the period, including such writers as Shaw, Beckett, Yeats, T. S. Eliot, Auden, Conrad, Joyce, Lawrence, Greene, Lessing, Murdoch, and Fowles.

30.247 Topics in Twentieth-Century English Literature 4 Q.H.

Examines closely the work of a single author or group of authors (e.g., Lawrence or post-war authors) or a topic (e.g., forms of modernism or imperialism).

30.248 Sixteenth-Century Literature 4 Q.H.

Concentration on sonnets, love lyrics, and erotic narrative poetry, principally by Wyatt, Sidney, Marlow, and Shakespeare.

30.249 Masterpieces of World Literature 4 Q.H.

Includes a selection of "great books," primarily by non-English authors, that have been central to the development of Western thought and culture.

30.250 Shakespeare's Comedies 4 Q.H.

Studies the romantic comedies, problem comedies, and comedies of regeneration, ranging from *The Merchant of Venice* to *The Tempest*.

30.251 Shakespeare's Tragedies 4 Q.H.

Studies the nature of the tragic hero, the questioning of social norms, and the landscape of chaos, ranging from *Julius Caesar* to *King Lear*.

30.252 Topics in Shakespeare 4 Q.H.

Examines closely such topics as the history plays, Shakespeare in performance, the Shakespearean hero, and psychological approaches to Shakespeare.

30.253 Introduction to Shakespeare 4 Q.H.

The course covers a selection of the major plays of Shakespeare, including both tragedies and comedies.

30.254 Backgrounds in English and American Literature 4 Q.H.

Readings in translation of Greek, Roman, and biblical literature as background for literary study. Emphasis on the development of myth, genre, and theme. Readings will include, among others, Homer, Virgil, Ovid, the most influential parts of the Bible, and Dante.

30.255 Topics in Writing: Reading and Writing Non-Fiction 4 Q.H.

A combination of literary analysis and creative writing. Concentration on subjects of twentieth-century non-fiction prose such as politics, science, "culture," athletics, and natural history. Among authors who might be considered: Elizabeth Drew, Russell Baker, Stephen Jay Gould, Louise Thomas, John McPhee, Roger Angell, David Halberstam, Joseph Wood Krutch, and John Hay.

- 30.260 The Bible** 4 Q.H.
Study and analysis of selected books of the Bible. Texts are considered in their historical and literary contexts.
- 30.262 Approaches to Literature** 4 Q.H.
Exercises and readings in ancient and modern theories of literature. Included are Marxist, Freudian, Jungian, and New Critical theories, as well as selections from the criticism of Plato, Aristotle and the Romantics.
- 30.263 Modern Poetry** 4 Q.H.
Studies the origin and development of the modern tradition in poetry, its form and subject matter; includes such writers as Yeats, Hardy, Frost, Eliot, and Stevens.
- 30.264 Topics in Modern Poetry** 4 Q.H.
Focuses on a particular theme such as the poet's use of the past, his/her role in politics, a particular problem in modern poetry, or a particular group of modern poets.
- 30.266 Myth and Archetype in Literature** 4 Q.H.
Studies twentieth-century theories of myth and archetype as they have influenced our understanding and analysis of works of literature.
- 30.272 Studies in English Literature I** 4 Q.H.
A seminar on a special topic in English literature, such as color symbolism in literature or John Donne and the metaphysical poets.
- 30.273 Studies in English Literature II** 4 Q.H.
Continuation of 30.272.
- 30.274 Studies in American Literature I** 4 Q.H.
Studies a special topic in American literature, such as the genteel tradition or American humor.
- 30.275 Studies in American Literature II** 4 Q.H.
Continuation of 30.274.

30.277 Topics in Literary Criticism 4 Q.H.
Studies a particular problem, method, or school of criticism, such as structuralism, mythopoetic, or archetypal criticism.

30.279 Contemporary Poetry 4 Q.H.
Focuses primarily on British and American poetry since World War II. Includes such writers as Roethke, Plath, Olson, Ammons, Hughes, and Larkin.

30.280, 30.281 Junior-Senior Seminar 4 Q.H.
(Open to all upperclass students in the College of Arts and Sciences; first preference is given to those needing the course to complete the major). The upperclass student with a strong competence in the humanities will have the chance to devise, pursue, and develop a response to an important issue in literature (e.g., the writer and the audience, the tradition of the new, style and meaning in literature, and literature and society). Class-time emphasis will be on discussing the broader implications of the issue dealt with by the seminar, as well as on presenting independent research toward the end of the quarter. The role of the instructor will be that of moderator, research resource, and guide, rather than that of lecturer.

30.290, 30.291 Directed Study (each) 4 Q.H.

30.295, 30.296, 30.297, 30.298 Junior-Senior Honors Program (each) 4 Q.H.
For prerequisites and other details, see the section on the Junior-Senior Honors Program on page 5.

Modern Languages

Prerequisites listed for Modern Languages are based on current course numbers at Northeastern. If approved by the Department of Modern Languages and the Dean's Office, equivalent course work done elsewhere may be considered acceptable to satisfy these prerequisites.

The courses described immediately below are given in *English*, and no knowledge of a foreign language is required to take them. For language majors interested in obtaining major credit for any of these courses, please consult your instructor.

31.217 French Literature in Translation 4 Q.H.
An elective course for all students, offering a study of some of the most significant works of French literature in translation.

31.252 The Theme of Solitude in French Literature 4 Q.H.
Course conducted in English. Texts read in

English translation (those who wish to do so may read them in French). The multiple facets of the theme of solitude traced from the beginnings of French literature to that of the present. Viewed as both a source of wonder and anguish, solitude studied in its various manifestations, including banishment, imprisonment, expatriation, and seclusion. The phenomena of moral and spiritual solitude are examined as well. Authors studied include Charles d'Orleans, Du Bellay, Rousseau, Chateaubriand, Hugo, Verlaine, Mauriac, and Camus.

31.255 Masterpieces of Modern European Fiction**4 Q.H.**

This course is conducted in English and focuses on modern European authors, including Dostoevski, Mann, Kafka, Proust, Gide, and Camus. Their works are viewed as commentaries on their respective societies and, more generally, as investigations of the human condition.

31.282 French Seminar: Voltaire and Rousseau**4 Q.H.**

This course offers an opportunity to study and compare the two great figures of the eighteenth century. Through an analysis of their works, students have the opportunity to determine how, by their contrasting interests, personalities, and views of society, these writers contributed to fundamental changes in the political, philosophical, and literary world of their time—and ours. Class discussion, oral and written reports. Conducted in English. Offered in alternate years.

32.215 Backgrounds in Hispanic Culture I**4 Q.H.**

A multimedia approach is utilized to present the rich panorama of the humanities from Altamira to modern times. A reading knowledge of Spanish is helpful but not required, since the course is conducted in English. Field trips, concerts, guest speakers, and individual study projects enhance this exploration of Spanish creativity.

32.216 Backgrounds in Hispanic Culture II**4 Q.H.**

This course spans the time from pre-Columbian days to the present in Latin America, exploring culture, traditions, and attitudes. A multimedia approach with field trips and guest lecturers. Conducted in English.

32.217 Saints and Sinners: The Vision of Women in the Middle Ages and the Renaissance**4 Q.H.**

Topics include the attainment of and the atonement for love; society's changing attitude toward women as reflected in the literature of the times. Selected fabliaux, short stories, poems, and plays from Boccaccio, Chaucer, Ruiz, Rojas, Machiavelli, Lope de Vega, Calderon, Quevedo, Racine, Middleton, as well as women writers. Reference is made to historical and sociological materials. This course is offered in English. All required readings are in translation.

34.215 Backgrounds in Russian Culture**4 Q.H.**

Designed to offer the student a view of Russian culture and civilization, the course utilizes guest speakers, films, field trips, and discussions. Conducted in English.

34.217 The Works of Alexander Pushkin in Translation**4 Q.H.**

The course offers a survey and analysis in English of Alexander Pushkin's artistic prose, lyric poetry, correspondence, friendships, and major literary influences.

34.218 Russian Literature in Translation**4 Q.H.**

A companion to 34.217, this is a survey and analysis in English of some of the works of Tolstoi, Dostoevski, Chekhov, and others.

35.217 The Works of Dante in**Translation I****4 Q.H.**

This course considers briefly the cultural background and various literary schools that influenced Dante. His life, his character, and his minor works are discussed. The *Vita Nuova* and the first cantica of the *Divina Commedia*, the "Inferno," are read and analyzed in some detail. This course is intended for students of any background or major. Bilingual texts will be used so that students with a background in Italian may refer to the original for added interest and enrichment. Classes are conducted in English.

35.218 The Works of Dante in**Translation II****4 Q.H.**

Continuation of 35.217, but may be taken separately. The other two parts of the *Divina Commedia*, "Purgatorio" and "Paradiso," are studied in detail. The course is open to anyone. Bilingual texts used. Classes conducted in English.

35.280 Italian Seminar: Pirandello**4 Q.H.**

By viewing reality and human personality with strikingly new insights, Pirandello contributed a new dimension to our understanding of human nature and brought about significant changes to the traditional conception of the theatre. We will examine the originality and art of Pirandello by a close study of some of his great plays and short stories. Class discussions, oral and written reports. Conducted in English. Offered in alternate years.

French

31.201 Elementary French I**4 Q.H.**

Designed for students with very little or no prior knowledge of French, this course provides a lively introduction to basic oral expression, listening comprehension, and elementary reading and writing. The audio-lingual approach, using practical vocabulary drawn from realistic situations, aims at good pronunciation and ease in response. Each lesson incorporates helpful information about daily life in France and the varied cultures within the world of French speakers. Laboratory practice complements classwork, enables students to work aloud at their own speed, reinforces their acquisition of essential structures, and acquaints them with a vast library of audio-visual resources.

31.202 Elementary French II**4 Q.H.**

(Prereq. 31.201)

This course's intent is to continue and broaden beginners' exposure to the "four skills"—oral

comprehension, speaking, reading, and writing French—so that the linguistic tools needed to understand and function in foreign contexts—at home, abroad, and in the world of literature and film—may be acquired.

31.203 Intermediate French I **4 Q.H.**
(Prereq. 31.202 or equiv.)

This course, for students who wish to further their audio-lingual skills and improve their reading and writing, combines a review and continued study of grammar essentials with oral, writing, and language laboratory practice. Varied readings include journalistic, cultural, and modern literary texts. Classes are conducted in French as much as possible so that students may exercise their new skills.

31.204 Intermediate French II **4 Q.H.**
(Prereq. 31.203)

This course uses the fundamentals of French to promote effective self-expression through speaking and writing and to explore the idiomatic aspects of the language. Through progressive class discussions and oral and written commentaries, students analyze a contemporary French novel or a French cultural reader, screenplay, or collection of short stories. The course strives first, to help students read and comprehend modern French writing with confidence, and to be able to talk and write about it in good French; and second, to provide them the opportunity to prepare for advancement to courses beyond the intermediate level.

31.205 Reading French in the Arts and Sciences **4 Q.H.**
(Prereq. 31.202 or equiv.)

This course is designed for those students who wish to develop their reading skills, without regard to other aspects of the language such as speaking or writing. To this end, the grammar necessary for reading is stressed, together with vocabulary building. Scientific and nonscientific texts are read. This course may also provide assistance to students, graduate and undergraduate, who need to pass a reading examination to fulfill specific degree requirements. However, it should be made clear that this course is not a substitute for 31.203 or 31.204 (Intermediate French).

31.215 Introduction to the French-Speaking World **4 Q.H.**
(Prereq. 31.204 or equiv.)

This course offers a cultural introduction to the French-speaking world through the study of various reading selections in the textbook *Le Monde Francais*. These selections, which stress vocabulary building and proper usage of a wide variety of grammatical forms, deal with the traditional backgrounds and aspects, as well as the contemporary and “pop” aspects, of the cultural heritage of the world’s French speakers. France

will be the main, but not the exclusive, focus of this course.

31.217 Modern Philosophical French Literature in Translation **4 Q.H.**

Camus and Sartre are considered to have been the spokesmen for their generation’s philosophical concerns. Works by these two authors are studied in the course and a working knowledge of existentialism is developed from them. Course given in English.

31.227 French Composition and Conversation I **4 Q.H.**

This course is designed for qualified students who wish to work on improving their proficiency in speaking and writing French through oral reports, class discussions, compositions, and an advanced review of fundamentals. Grammar work focuses on the students’ particular needs as well as the nuances of the language. Varied readings in a range of styles—popular to literary—provide insight into French life and culture. Conducted in French.

31.228 French Composition and Conversation II **4 Q.H.**
(Prereq. 31.227 or equiv.)

A continuation of French 31.227, with emphasis on individual work, oral presentations, discussions, related grammar, and analysis of readings. Conducted in French.

31.229 Advanced French Proficiency I **4 Q.H.**
(Prereq. 31.227 and 31.228 or equiv.)

Emphasis is on further vocabulary building and mastery of fine points of grammar through written composition, prepared oral reports, and reading and discussion of articles from current periodicals. Special attention is given to the latest trends in spoken French, the study of idioms and proverbs, as well as selected examples of “argot” (slang).

31.230 Advanced French Proficiency II **4 Q.H.**
(Prereq. 31.227 and 31.228 or equiv.)

This course is the continuation of 31.229. In addition to further study in the areas covered in course 31.229, each student is expected to pursue one major project throughout the course, to be completed at the end of the quarter—such as planning and writing an original French magazine with one article to be submitted each week of the term.

31.231 Masterpieces of French Literature I **4 Q.H.**
(Prereq. 31.204 or equiv.)

This course provides an introduction to French poetry, theatre (both comedy and tragedy), novels, and autobiographies through the study of key works from the Middle Ages and Renaissance through the Age of Enlightenment. The course includes such writers as Villon, Molière, Racine, Voltaire, and Rousseau. The course, conducted largely in French, aims to

acquaint students with a critical approach to reading; to help them improve their reading, speaking, and writing skills; and to apply these new skills to a greater understanding and appreciation of major French contributions to Western culture. Group discussions are encouraged in an effort to bring out the relation between the texts and contemporary issues.

32.232 Masterpieces of French Literature II

4 Q.H.

(Prereq. 31.204 or equiv.)

A continuation of 31.231, which is not necessarily a prerequisite. The course presents some of the most interesting and significant works of literature from the Romantic Age to the present. Among the readings are an "existential" play by Musset, poetry by Baudelaire and Verlaine, and fiction by Flaubert, Camus, and Robbe-Grillet. For a description of methodology, see 31.231.

31.243 French Literature in the Splendid Century

4 Q.H.

(Prereq. 31.232 or equiv.)

This course presents a study of the nondramatic literature of seventeenth-century France from the baroque through the classical periods. The course studies a rich and diverse body of writing encompassing philosophy, poetry, the table, the novel, and epistolary writing. Among the authors treated are Descartes, Pascal, La Rochefoucauld, La Fontaine, Boileau, Mme. de Sevigne, and Mme. de La Fayette. Offered every other year.

31.244 French Theatre in the Splendid Century

4 Q.H.

(Prereq. 31.232 or equiv.)

This course offers a study of the dramatic literature of seventeenth-century France, from the baroque through the classical periods. Tragedy is studied in the works of Corneille and Racine; comedy, in those of Moliere. Offered every other year.

31.245 French Literature of the Eighteenth Century I

4 Q.H.

(Prereq. 31.232 or equiv.)

The eighteenth century in France, known as the Age of Enlightenment, was an age of challenge to established authority in all areas, and an age of changing ideas and ideals. This intellectual and political vitality is reflected in the representative works of Marivaux, Montesquieu, Prevost, and Voltaire. Class discussions, oral and written reports. Conducted in French, but English is allowed. Offered every other year.

31.246 French Literature of the Eighteenth Century II

4 Q.H.

(Prereq. 31.232 or equiv.)

Toward the latter half of the century we begin to see both the achievements brought about by the

spirit of enlightenment and at the same time the awakening of the romantic sensibility, particularly in such authors as Diderot, Rousseau, St. Pierre, Laclos, and Beaumarchais. Class discussions, oral and written reports. Conducted in French, but English is allowed. Offered in alternate years.

31.247 French Literature of the Nineteenth Century I

4 Q.H.

(Prereq. 31.232 or equiv.)

Romanticism is treated as a major cultural phenomenon affecting man's view of his world and the way he expresses experience. In this context, the course examines romanticism in poetry and drama, as well as its continuation into the realist novel. Among the authors read are Victor Hugo in poetry and the drama, and Honore de Balzac in the novel. In addition there are selections from other writers who represent aspects of romanticism and realism. Conducted principally in French. Offered every other year.

31.248 French Literature of the Nineteenth Century II

4 Q.H.

(Prereq. 31.232 or equiv.)

This course deals with the reaction against romanticism: aestheticism and personal modes of expression in contrast to the enthusiasm of the early romantics. The course deals with a novel by Gustave Flaubert and the verse of Charles Baudelaire in *Les Fleurs du mal*, and the poets who followed in Baudelaire's footsteps. Flaubert and Baudelaire are seen as precursors of modern literature. Conducted principally in French. Offered every other year.

31.249 French Literature of the Twentieth Century I

4 Q.H.

(Prereq. 31.232 or equiv.)

This course offers a study of the major movements in the narrative and dramatic prose writers prior to World War II, including Alain-Fournier, Proust, Claudel, Gide, Mauriac, and Saint-Exupery. Students are required to read a work from each author, discuss it in class, and present oral and written reports. Conducted in French, but English may be used. Offered in alternate years.

31.250 French Literature of the Twentieth Century II

4 Q.H.

(Prereq. 31.232 or equiv.)

This course focuses on the trends in postwar fiction, with particular consideration of the struggle to find meaning in an absurd world. Analysis of significant works by Giraudoux, Montherlant, Sartre, Camus, Anouilh, Ionesco, and Beckett. Oral and written reports, class discussions. Conducted in French, but English may be used. Offered in alternate years.

31.252 The Theme of Solitude in French Literature

4 Q.H.

Course conducted in English. Texts read in English translation (those who wish to do so

may read them in French). The multiple facets of the theme of solitude are traced from the beginnings of French literature to the present. Viewed as a source of both wonder and anguish, solitude is studied in its various manifestations, including banishment, imprisonment, expatriation, and seclusion. The phenomena of moral and spiritual solitude are examined as well. Among authors studied are Charles d'Orleans, Du Bellay, Rousseau, Chateaubriand, Hugo, Verlaine, Mauriac, and Camus.

31.255 Masterpieces of Modern European Fiction 4 Q.H.

This course is conducted in English and focuses on modern European authors, including Dostoevski, Mann, Kafka, Proust, Gide, and Camus. Their works are viewed as commentaries on their repsective societies and, more generally, as investigations of the human condition.

31.280 Seminar: Critical Methodology and Practice in French Literature 4 Q.H.

(Prereq. Excellent reading knowledge of French)
The seminar treats one modern French writer in terms of a critical methodology developed in the first part of the seminar based on modern critical practice.

31.281 Seminar: Trends in Modern French Literature 4 Q.H.

(Prereq. Excellent reading knowledge of French)
The seminar examines a trend in modern French literature and develops a critical methodology useful for this analysis.

31.282 French Seminar: Voltaire and Rousseau 4 Q.H.

This course offers an opportunity to study and compare the two great figures of the eighteenth century. Through an analysis of their works, students may determine how, by their contrasting interests, personalities, and views of society, these writers contributed to fundamental changes in the political, philosophical, and literary world of their time—and ours. Class discussion, oral and written reports. Conducted in English. Offered in alternate years.

31.290, 31.291, 31.292, 31.293, 31.294 Directed Study (each) 4 Q.H.

Directed Studies offer students a way of going beyond work given in the regular curriculum and may also serve as a means to complete major or minor requirements in certain situations. Directed Studies will not be given in areas adequately covered by existing courses. Priority is given to language majors and to juniors and seniors.

31.295, 31.296, 31.297, 31.298 Junior-Senior Honors Program (each) 4 Q.H.

For prerequisites and other details, see the section on the Junior-Senior Honors Program on page 5.

Spanish

Prerequisites listed for Modern Languages are based on current course numbers at North-eastern. Equivalent course work done elsewhere may be considered acceptable to satisfy these prerequisites.

32.200 Intensive Spanish 8 Q.H.

This course encompasses the same material covered in 32.201 and 32.202. Students with language-learning ability and a commitment to the study of foreign languages are encouraged to take the course. Students are expected to assimilate the material at an accelerated pace. This is a two-sequence course; students *must* enroll in *both* sequences. Satisfactory completion of this course enables the student to take 32.203 if he/she wishes.

32.201 Elementary Spanish I 4 Q.H.

The course includes presentation of essentials of correct usage through acquisition of basic skills in reading, writing, speaking, and aural comprehension.

32.202 Elementary Spanish II 4 Q.H.

(Prereq. 32.201 or equiv.)
Continuation of language instruction with increasing attention to vocabulary and skills relevant to persons who wish to become involved with the Hispanic world.

32.203 Intermediate Spanish I 4 Q.H.

(Prereq. 32.202 or equiv.)
Included are completion of basic grammatical usage. Reading of contemporary Hispanic plays; oral and written communication based upon assigned readings.

32.204 Intermediate Spanish II 4 Q.H.

(Prereq. 32.203 or equiv.)
The course offers intensive reading of topics of current interest; conversation practice utilizing skills acquired in previous course work; and composition practice based upon varied assigned topics.

32.209 Conversational Spanish I 4 Q.H.

(Prereq. 32.204 or equiv.; open to non-majors only)
Emphasis is on helping students develop the ability to speak and comprehend Spanish. Particularly able students may be accepted after having completed only 32.203. In this case, 32.209 may be used to satisfy the language requirement.

32.210 Conversational Spanish II 4 Q.H.

(Prereq. 32.209 or equiv.; open to non-majors only)
Continuation of 32.209, with continuing emphasis on the development of oral facility in Spanish. Particularly able students may be accepted after having completed only 32.204.

32.215 Backgrounds in Hispanic Culture I 4 Q.H.

A multimedia approach is utilized to present the rich panorama of the humanities from Altamira

to modern times. A reading knowledge of Spanish is helpful but not required, since the course is conducted in English. Field trips, concerts, guest speakers, and individual study projects enhance this exploration of Spanish creativity.

32.216 Backgrounds in Hispanic Culture II 4 Q.H.

This course spans the time from pre-Columbian days to the present in Latin America, exploring culture, traditions, and attitudes. A multimedia approach with field trips and guest lecturers. Conducted in English.

32.217 Saints and Sinners: The Vision of Women in the Middle Ages and the Renaissance 4 Q.H.

Topics include the attainment of and the atonement for love; society's changing attitude toward women as reflected in the literature of the times. Selected fabliaux, short stories, poems, and plays from Boccaccio, Chaucer, Ruiz, Rojas, Machiavelli, Lope de Vega, Calderon, Quevedo, Racine, Middleton, as well as women writers. Reference is made to historical and sociological materials. This course is offered in English. All required readings are in translation.

32.227 Spanish Composition and Conversation I

4 Q.H.

(Prereq. 32.204 or equiv.)

This course offers practice in writing and speaking Spanish, including written and oral resumes, prepared speeches and themes, and impromptu speaking and writing. A review of the more subtle problems of grammar.

32.228 Spanish Composition and Conversation II

4 Q.H.

(Prereq. 32.227 or equiv.)

This course offers further practice in oral and written Spanish; continued study of problems of advanced Spanish grammar.

32.229 Advanced Spanish Proficiency I 4 Q.H.

(Prereq. permission of instructor)

This course is designed for those preparing to enter the teaching profession, as well as qualified advanced students. Advanced elements of Spanish syntax, with emphasis upon achieving superior speaking, reading, and writing skills.

32.230 Advanced Spanish Proficiency II 4 Q.H.

(Prereq. 32.229 and permission of instructor)

Continuation of aims and goals of 32.229.

32.231 Masterpieces of Spanish Literature I

4 Q.H.

(Prereq. 32.204 or equiv.)

An introductory course tracing the development of Spanish literature from its beginnings in the Middle Ages (las jarchas, *El poema del Cid*, *El libro de buen amor*, *La Celestina*, etc.) through the Renaissance and Baroque periods or Golden Age (Garcilaso de la Vega, the picaresque novel, the mystics, Cervantes, Lope de Vega, Calderon, etc.). Classes are conducted in Spanish.

32.232 Masterpieces of Spanish Literature II

4 Q.H.

(Prereq. 32.204 or equiv.)

A continuation of 32.231, surveying the literature of eighteenth-, nineteenth-, and twentieth-century Spain. Included are the literary movements of romanticism, realism, and the generation of '98. Classes are conducted in Spanish.

32.239 Spanish Literature of the Middle Ages

(Prereq. 32.232 or equiv.)

4 Q.H.

The course offers selections from the major works of the Middle Ages, from the *Poema del Cid* to the *Libro de buen amor*. Conducted in Spanish.

32.241 Spanish Literature of the Fifteenth and Sixteenth Centuries

4 Q.H.

(Prereq. 32.232 or equiv.)

This course examines selections from the major works of the fifteenth and sixteenth centuries. Some of the works to be considered are *La Celestina*, *Lazarillo de Tormes*, and *El Romancero*. Conducted in Spanish.

32.243 Cervantes and His Times

4 Q.H.

(Prereq. 32.232 or equiv.)

The course examines selections from Cervantes' minor works (the *Entremeses* and the *Novelas ejemplares*); emphasis, however, is on *Don Quixote*, Spain's greatest literary masterpiece. Conducted in Spanish.

32.244 Spanish Golden Age Theatre

4 Q.H.

(Prereq. 32.232 or equiv.)

The course examines plays by the outstanding dramatists of the seventeenth century: Lope de Vega, Calderon de la Barca, Tirso de Molina, Ruiz de Alarcon, and others. Conducted in Spanish.

32.247 Spanish Literature of the Nineteenth Century I

4 Q.H.

(Prereq. 32.232 or equiv.)

The course includes readings in the prose, poetry, and drama of the romantic period, including selections from el Duque de Rivas, Larra, Espronceda, Zorrilla, and Becquer. Conducted in Spanish.

32.248 Spanish Literature of the Nineteenth Century II

4 Q.H.

(Prereq. 32.232 or equiv.)

This course offers a study of some of the major novelists of the second half of the nineteenth century, such as J. M. de Pereda, Juan Valera, Emilia Pardo Bazan, and B. Perez Galdos. Conducted in Spanish.

32.249 Spanish Literature of the Twentieth Century I

4 Q.H.

(Prereq. 32.232 or equiv.)

The course examines selections from the writings of the Generation of '98: Unamuno, Valle-Inclan, Pio Baroja, Benavente, Azorin, and the Machado brothers.

32.250 Spanish Literature of the Twentieth Century II 4 Q.H.

(Prereq. 32.232 or equiv.)

The course focuses on prose and poetry of modern writers, such as Ortega y Gasset, Perez de Ayla, Garcia Lorca, Juan Ramon Jimenez, Gironella, and Jose Cela.

32.251 Latin American Literature 4 Q.H.

(Prereq. 32.232 or equiv.)

The course focuses on early Latin American literature: the literature of the colonial period and the early nineteenth century, based primarily on selections from an anthology.

32.252 Latin-American Literature 4 Q.H.

(Prereq. 32.232 or equiv.)

This course focuses on modern Latin American literature; readings from nineteenth- and twentieth-century prose and poetry.

32.280 Spanish Seminar 4 Q.H.

This course is designed primarily for majors who have progressed to the upper-level literature courses in Spanish. However, nonmajors who show exceptional background may be admitted with the instructor's permission. The course focuses upon a narrowly defined theme (i.e., a single author, a single work, or a single theme), which students are asked to explore in depth; students are expected to present a final paper based upon individual research.

32.281 Seminar in Spanish Literature 4 Q.H.

(Prereq. Permission of instructor)

This is an upper-level literature course designed primarily for majors, although nonmajors who show exceptional background in Spanish may be admitted. Students are expected to read a selected group of Galdos' novels, and the class meetings will concentrate on a detailed discussion and analysis of the works read. There are collateral readings as well, and a final paper on a topic to be selected by the student.

32.282 Seminar in the Contemporary Spanish Theatre 4 Q.H.

(Prereq. 32.232 or permission of instructor)

In contrast to the typical bourgeois theatre of consumption in Spain, there exists a number of dramatists committed to revealing the tragic social and existential aspects of the human condition. Emphasis is placed on authors such as Vallejo, Sartre, the members of the *generacion realista*, and the "underground" playwrights. Classes are conducted in Spanish. Class participation as well as oral and written projects required. Alternates yearly with 32.281.

32.290, 32.291, 32.292, 32.293, 32.294 Directed Studies (each) 4 Q.H.

Directed Studies offer students a way of going beyond work given in the regular curriculum and may also serve as a means to complete major or minor requirements in certain situations. Directed Studies will not be given in areas

adequately covered by existing courses. Priority is given to language majors and to juniors and seniors.

32.295, 32.296, 32.297, 32.298 Junior-Senior Honors Program (each) 4 Q.H.

For prerequisites and other details, see the section on the Junior-Senior honors Program on page 5.

German

Prerequisites listed for Modern Languages are based on current course numbers at North-eastern. Equivalent course work done elsewhere will be considered acceptable to satisfy these prerequisites.

33.201 Elementary German I 4 Q.H.

This course is designed to provide instruction in the basic grammatical structure of German through practice in listening comprehension, speaking, reading, and writing. Instruction is provided in the classroom and in the language laboratory. No previous study of German necessary. (Special sections of this course are run for business students.)

33.202 Elementary German II 4 Q.H.

(Prereq. 33.201 or equiv.)

A continuation of 33.201, this course emphasizes helping students to increase their knowledge of the basic grammatical structure of German and to develop additional flexibility in the four language skills. (Special sections of this course are run for business students.)

33.203 Intermediate German I 4 Q.H.

(Prereq. 33.202 or equiv.)

This course offers a comprehensive review and reinforcement of the major aspects of German grammar and usage; continues to explore the four major skills of listening comprehension, speaking, reading, and writing; introduces the student to the reading of contemporary literary texts, including a full-length play—*Biedermann und die Brandstifter*, by the Swiss playwright Max Frisch.

33.204 Intermediate German II 4 Q.H.

(Prereq. 33.203 or equiv.)

The course aims at helping students enlarge vocabulary and develop increased flexibility in the four basic language skills. Included are completion of grammar review, continued exposure to modern literary texts. One full-length play is read—*Der Besuch der alten Dame*, by the contemporary Swiss dramatist Friedrich Durrenmatt. Successful completion of this course entitles the student to choose from among the upper-level course offerings in the areas of German literature and/or composition and conversation.

33.207 Reading German 4 Q.H.

This course is designed for those students who wish to develop their reading skills, without

regard to other aspects of the language, such as speaking or writing. The grammar necessary for reading is stressed, together with vocabulary building; scientific and nonscientific texts are read. This course may provide assistance to students, graduate and undergraduate, who need to pass a reading examination to fulfill specific degree requirements.

33.227 German Composition and

Conversation I

4 Q.H.

(Prereq. 33.204 or equiv.)

This course strives to develop facility in speaking and writing German and stresses active use of the language. Students are provided an opportunity for practice in listening comprehension through German language films or tape-recorded interviews with native German speakers; expansion of vocabulary through guided group discussions on topics of general interest; and development of language skills in areas of individual interest through preparation of oral reports in German. Compositions are assigned on a weekly basis and grammar is reviewed as needed. Utilization of language laboratory. Recommended for students preparing for co-op in Germany.

33.228 German Composition and

Conversation II

4 Q.H.

(Prereq. 33.227 or equiv.)

Continuation of German 33.227 in content and format with emphasis on independent communication skills. Recommended for students preparing for co-op in Germany.

33.229 Advanced German Proficiency I

4 Q.H.

(Prereq. 33.227 and 33.228, or permission of instructor)

The course offers intensive training in spoken and written German with the aim of providing students an opportunity to increase vocabulary and develop flexibility in the use of the language. Included are student-led discussions of German society and current affairs based on readings of current journals and periodicals; weekly written assignments; review and practice of grammar where necessary.

33.231 Masterpieces of German

Literature I

4 Q.H.

(Prereq. 33.204 or equiv.)

The course includes a survey of the major trends in the development of German literature from the *Hildebrandslied* to Martin Luther. In addition, reading of selected works of major authors of the twentieth century such as Hauptmann, Kafka, Mann, Brecht, Durrenmatt, and Boll. Choice of works to be read in a particular term will be based partially on theatre performances of film showings planned in the Boston area. Class attendance of these performances is anticipated. Recommended as an introductory step to literature courses 33.245 and above. Offered every other year, alternating with 33.232.

33.232 Masterpieces of German Literature II

4 Q.H.

(Prereq. 33.204 or equiv.)

This course includes a survey of the major trends in the development of German literature from Martin Luther to the present, including selected works of major authors of the nineteenth and twentieth centuries. Choice of works to be read in a particular term will be based partially on theatre performances or film showings planned in the Boston area. Class attendance of these performances is anticipated. Recommended as an introductory step to literature courses 33.245 and above. Offered every other year, alternating with 33.231. May be taken before 33.231.

33.235 Applied Linguistics

4 Q.H.

The course explores the process of language learning and the nature of this experience for infants and adults. Emphasis is on the child's ability to master successfully the complex essentials of its first language by the age of five, and how the development of cognitive capacity and language-learning ability are related. The role of the parent and of the physical environment will also be discussed. Other topics include second-language learning, contrastive analysis, learning English as a second language or dialect, sign language, the significance of "errors," learning strategies, and a survey of language-teaching methods.

33.245 Classical Period of German Literature

4 Q.H.

(Prereq. 33.232 or equiv.)

The course provides background and general survey of the period from 1750 to 1800, with particular emphasis on the works of Lessing and Schiller. Among the dramas read are Lessing's *Minna von Barnhelm* and *Nathan der Weise*, and Schiller's *Maria Stuart* and *Die Jungfrau von Orleans*. Lectures (in German) and reports.

33.246 The Works of Goethe

4 Q.H.

(Prereq. 33.232 or equiv.)

The course includes drama, prose writing, and lyric poetry of Goethe: *Faust*, Part I; *Hermann und Dorothea*; *Egmont*; and *Iphigenie auf Tauris*. Lectures (in German) and reports.

33.247 German Literature of the Nineteenth Century

4 Q.H.

(Prereq. 33.232 or equiv.)

The course offers background and general survey of German literature of the nineteenth century, with particular attention to prose and lyric poetry. The lyric poetry includes poems of all the important romantic poets, beginning with Holderlin, Tieck, Novalis, and extending through Morike. Among the prose works discussed are *Novellen* by Eichendorff, Tieck, Chamisso, Kleist, Fougue, Keller, Meyer, and Ludwig. Lectures (in German) and reports.

33.248 German Drama of the Nineteenth Century 4 Q.H.

(Prereq. 33.232 or equiv.)

Dramas read are selected from Germany's foremost dramatists of the nineteenth century, including Kleist, Hebbel, Grillparzer, and Ludwig. Lectures (in German) and reports.

33.249 German Literature of the Twentieth Century 4 Q.H.

(Prereq. 33.232 or equiv.)

The course includes lyric poetry and prose works of important German writers of the twentieth century, including Schnitzler, Hauptmann, Mann, and Kafka. Lectures (in German) and reports.

33.250 German Drama of the Twentieth Century 4 Q.H.

(Prereq. 33.232 or equiv.)

Plays are selected from those by important dramatists of the twentieth century, including Schnitzler, Hauptmann, Sudermann, Hofmannsthal, Wedekind, Kaiser, Toller, and Brecht. Lectures (in German) and reports.

33.251 The German Lyric 4 Q.H.

(Prereq. 33.232 or equiv.)

The course offers a survey of the German lyric from the twelfth century to the present. Analysis and interpretation of representative selections from major lyric poets such as Walther von der Vogelweide, Gerhard. Fleming, Gryphius, Klopstock, Claudius, Goethe, Schiller, Holderlin, Eichendorff, Brentano, Heine, Morike, Storm, Meyer, Rilke, and Brecht. Background of the development of the German lyric, movements, and types. Class discussions and reports.

33.252 The Dramatic Works of Franz Grillparzer 4 Q.H.

(Prereq. 33.232 or equiv.)

The course includes reading, analysis, and interpretation of representative works of Franz Grillparzer, Austria's greatest dramatist: *Sappho*, *Des Meeres und der Liebe Wellen*, *Der Traum ein Leben*, *König Ottokars Glück und Ende*, and the novella *Der arme Spielmann*. Collateral readings, discussions, and reports.

33.290, 33.291, 33.292, 33.293, 33.294 Directed Studies (each) 4 Q.H.

Directed Studies offer students a way of going beyond work given in the regular curriculum and may also serve as a means to complete major or minor requirements in certain situations. Directed Studies will not be given in areas adequately covered by existing courses. Priority is given to language majors and to juniors and seniors.

33.295, 33.296, 33.297, 33.298 Junior-Senior Honors Program (each) 4 Q.H.

For prerequisites and other details, see the section on the Junior-Senior Honors Program on page 5.

Chinese

34.101 Elementary Chinese I 4 Q.H.

This is a course in "Mandarin" Chinese designed to acquaint the student with features of the spoken and written language. Grammar, oral performance, and simple characters are stressed. For students who wish to speak another dialect of Chinese, consult instructor for proper placement.

34.102 Elementary Chinese II 4 Q.H.

(Prereq. 34.101)

This course is a continuation of 34.101. Grammar and spoken and written forms of the language are studied.

34.103 Intermediate Chinese I 4 Q.H.

(Prereq. 34.102)

This course is a continuation of 34.102. More advanced features of the language. Continued study of characters.

34.104 Intermediate Chinese II 4 Q.H.

(Prereq. 34.103)

This course is a continuation of 34.103. More advanced work in grammar, conversation, and characters.

Russian

Prerequisites listed for Modern Languages are based on current course numbers at North-eastern. Equivalent course work done elsewhere will be considered acceptable to satisfy these prerequisites.

34.201 Elementary Russian I 4 Q.H.

The course includes essentials of grammar, practice in pronunciation, progressive acquisition of a basic vocabulary, idiomatic expressions.

34.202 Elementary Russian II 4 Q.H.

(Prereq. 34.201)

Continuation of grammar study; oral and written exercises.

34.203 Intermediate Russian I 4 Q.H.

(Prereq. 34.202)

Designed to help further the student's knowledge of Russian through oral and written work; the study of grammar and reading texts of moderate difficulty.

34.204 Intermediate Russian II 4 Q.H.

(Prereq. 34.203)

Continuation of work and aims of 34.203.

34.207 Scientific Russian 4 Q.H.

(Prereq. 34.204 or equiv.)

The course offers readings of Russian texts in mathematics, physics, chemistry, astronomy, biology, and medical science. Designed to help prepare the student for the department reading examination in his/her chosen field. As far as

possible, texts are selected on the basis of the students' needs and interests.

34.215 Backgrounds in Russian Culture 4 Q.H.
Designed to offer the student a view of Russian culture and civilization, the course utilizes guest speakers, films, field trips, and discussions. Conducted in English.

34.217 The Works of Alexander Pushkin in Translation 4 Q.H.
This course offers a survey and analysis in English of Pushkin's artistic prose, lyric poetry, correspondence, friendships, and major literary influences.

34.218 Russian Literature in Translation 4 Q.H.
A companion to 34.217, this is a survey and analysis in English of some of the works of Tolstoi, Dostoevski, Chekhov, and others.

34.227 Russian Composition and Conversation I 4 Q.H.
(Prereq. 34.204 or equiv.)
Designed to assist students in developing skills in speaking and writing by means of detailed grammar review and extensive use of audio-visual media. Conducted in Russian.

34.228 Russian Composition and Conversation II 4 Q.H.
(Prereq. 34.227 or equiv.)
A continuation of 34.227 with an increased emphasis on speaking the colloquial Russian idiom. Conducted in Russian.

34.229 Advanced Russian Proficiency I 4 Q.H.
(Prereq. 34.228 or equiv.)
Emphasizes speaking and writing skills through the study of Russian word formation and derivation. Weekly compositions or oral reports are required. Conducted in Russian.

34.230 Advanced Russian Proficiency II 4 Q.H.
(Prereq. 34.229 or equiv.)
Emphasizes speaking and writing skills through the study and use of Russian idioms and colloquialisms. Conducted in Russian.

34.233 Stylistics and Advanced Grammar Analysis I 4 Q.H.
(Prereq. 34.204 or permission of instructor)
Designed for students pursuing a major or minor in the Russian language; focuses on modern usage of the Russian language through newspaper and magazine articles and short stories.

34.234 Stylistics and Advanced Grammar Analysis II 4 Q.H.
(Prereq. 34.233 or permission of instructor)
Continues goals of 34.233 and also focuses on helping students improve listening comprehension through the use of extensive laboratory work.

34.247 Russian Short Stories of the Nineteenth Century 4 Q.H.
(Prereq. 34.204 or equiv.)
The course offers detailed analysis of selected

representative short stories read in Russian; study of the development of this genre.

34.251 Russian Expository Prose 4 Q.H.
(Prereq. 34.204)
Selected readings of lectures, speeches, essays, and critical studies by outstanding Russian scholars.

34.253 Russian Folklore 4 Q.H.
(Prereq. 34.204)
Various genres of Russian folk literature are read in Russian. Readings are supplemented with lectures and tape recordings.

34.254 Russian Poetry 4 Q.H.
(Prereq. 34.204)
The major works of important classical and modern poets are read in Russian and analyzed.

34.290, 34.291, 34.292, 34.293, 34.294 Directed Studies (each) 4 Q.H.
Directed Studies offer students a way of going beyond work given in the regular curriculum and may also serve as a means to complete major or minor requirements in certain situations. Directed Studies will not be given in areas adequately covered by existing courses. Priority is given to language majors and to juniors and seniors.

34.295, 34.296, 34.297, 34.298 Junior-Senior Honors Program (each) 4 Q.H.
For prerequisites and other details, see the section on the Junior-Senior Honors Program on page 5.

Italian

Prerequisites listed for Modern Languages are based on current course numbers at North-eastern. Equivalent course work done elsewhere will be considered acceptable to satisfy these prerequisites.

35.201 Elementary Italian I 4 Q.H.
For the beginner who wants instruction in the essentials of Italian grammar and the opportunity to practice speaking and reading the language.

35.202 Elementary Italian II 4 Q.H.
(Prereq. 35.201 or equiv.)
Continued study of grammar and basic language skills. Practice in more advanced conversation and reading.

35.203 Intermediate Italian I 4 Q.H.
(Prereq. 35.202 or equiv.)
Review of grammar. Progressively more intensive practice in oral and written communication. Reading will be from selected modern texts.

35.204 Intermediate Italian II 4 Q.H.
(Prereq. 35.203 or equiv.)
Review of grammatical difficulties, with attention given to current idiomatic forms. Greater

emphasis on self-expression. Reading of short stories or a modern novel.

35.217 The Works of Dante in

Translation I

4 Q.H.

This course considers briefly the cultural background and various literary schools that influenced Dante. His life, his character, and minor works are discussed. The *Vita Nuova* and the first cantica of the *Divina Commedia*, the "Inferno," are read and analyzed in some detail. This course is intended for students of any background or major. Bilingual texts are used so that students with a background in Italian may refer to the original for added interest and enrichment. Classes are conducted in English.

35.218 The Works of Dante in

Translation II

4 Q.H.

This is a continuation of 35.217, but may be taken separately. The other two parts of the *Divina Commedia*, "Purgatorio" and "Paradiso," are studied in detail. The course is open to anyone. Bilingual texts used. Classes conducted in English.

35.227 Italian Composition and Conversation I

4 Q.H.

(Prereq. 35.204 or equiv.)

For students who have mastered the fundamentals of the language. There will be no study of grammar as such. The course aims at helping students strengthen speaking and writing ability through an analysis of the language, oral and written reports, and general discussions on a variety of topics. Conducted entirely in Italian.

35.228 Italian Composition and Conversation II

4 Q.H.

(Prereq. 35.227 or equiv.)

Continuation of 35.227, with stress on individual work, free discussions, and compositions. Conducted entirely in Italian.

35.231 Masterpieces of Italian Literature I

4 Q.H.

(Prereq. 35.204 or equiv.)

Introductory course in Italian literature covering the *Trecento* to the seventeenth century. An analysis will be made of major trends and writers beginning with the *doce stil nuovo*, Dante's *Vita Nuova*, and continuing with readings from Petrarca's *Canzoniere*, Boccaccio's *Decameron*, and Machiavelli's *La Mandragola*. Discussion of the readings, oral and written reports. Conducted basically in Italian, but students are allowed to express themselves in English.

35.232 Masterpieces of Italian Literature II

4 Q.H.

(Prereq. 35.204 or equiv.)

Continuation of 35.231, but may be taken separately. This course concentrates on authors from the eighteenth to the twentieth centuries, such as Goldoni, Leopardi, Verga, Pirandello, Moravia, Levi, and Buzzati. A novel, a play, or

poetry selections from each author will be discussed. Oral and written reports. Conducted basically in Italian, but students may use English.

35.249 Italian Literature of the Twentieth Century I

4 Q.H.

(Prereq. 35.232 or equiv.)

Reading and discussion of some of the novels, plays, and poems from a variety of literary trends and styles that evolved between the turn of the century and World War II. Among the authors studied are Verga, Pascoli, D'Annunzio, Pirandello, Deledda, and Svevo. Oral and written reports. The course will be conducted basically in Italian, but students may use English. Offered in alternate years.

35.250 Italian Literature of the Twentieth Century II

4 Q.H.

(Prereq. 35.232 or equiv.)

The postwar period to the present. Many important authors have arisen since the early forties, and their books reflect the preoccupations, moods, and aspirations of our changing times. Among the writers considered in this course are Moravia, Silone, Vittorini, Pavese, Guareschi, Buzzati, Sciascia, Ungaretti, Montale, and Quasimodo. Oral and written reports are required. English may be used, but the course will be conducted basically in Italian. Offered in alternate years.

35.280 Italian Seminar: Pirandello

4 Q.H.

By viewing reality in man's world and man's personality with strikingly new insights, Pirandello contributed a new dimension to our understanding of human nature and brought about significant changes to the traditional conception of the theatre. This course examines the originality and art of Pirandello by a close study of some of his great plays and short stories. Class discussions, oral and written reports. Conducted in English. Offered in alternate years.

35.290, 35.291, 35.292, 35.293, 35.294 Directed Studies

(each) 4 Q.H.

Directed Studies offer students a way of going beyond work given in the regular curriculum and may also serve as a means to complete major or minor requirements in certain situations. Directed Studies will not be given in areas adequately covered by existing courses. Priority is given to language majors and to juniors and seniors.

35.295, 35.296, 35.297, 35.298 Junior-Senior Honors Program

(each) 4 Q.H.

For prerequisites and other details, see the section on the Junior-Senior Honors Program on page 5.

American Sign Language

36.200 Intensive American Sign Language I

(Formerly 19.200)

8 Q.H.

This course combines the coursework of ASL I and ASL II into one quarter. In this structure, students may accelerate the development of basic conversational skills in ASL.

36.201 American Sign Language I

(Formerly 19.196)

4 Q.H.

An introduction to American Sign Language and deaf culture, this course focuses on frequently used signs, basic rules of grammar, nonmanual aspects of ASL, and some cultural features of the deaf community.

36.202 American Sign Language II

(Formerly 19.199)

4 Q.H.

(Prereq. 36.201 or permission of instructor)

A continuation of basic language and culture study, this course offers an opportunity to build receptive and expressive sign vocabulary. Study includes use of the signing space; further use of nonmanual components, including facial expression and body postures. Introduction to finger spelling.

36.203 Intermediate American Sign Language I

(Formerly 19.204)

4 Q.H.

(Prereq. 36.202 or permission of instructor)

This course emphasizes further development of receptive and expressive skills, finger spelling, vocabulary building, grammatical structures; encourages more creative use of expression, classifiers, body postures, and the signing space; introduces regional and ethnic sign variations and political and educational institutions of the Deaf community.

36.204 Intermediate American Sign Language II

(Formerly 19.208)

4 Q.H.

(Prereq. 36.203 or permission of instructor)

The course consists of intensive practice involving expressive and receptive skills in story telling and dialogue; introduction to language forms used in ASL poetry and to the features of culture as they are displayed in art and the theatre.

36.205 Sign Language Interpreting I

(Formerly 19.205)

4 Q.H.

(Prereq. 36.204 or permission of instructor)

This is the first of a three-course sequence involving the theoretical and practical aspects of simultaneous interpretation of English into sign language and vice versa. Through lectures, discussions, and role playing, students are introduced to ethics, definitions, client-interpreter relationships, linguistic considerations, mechanics, and special considerations for various interpreting situations.

36.206 Sign Language Interpreting II

(Formerly 19.211)

4 Q.H.

(Prereq. 36.205 or consent of instructor)

Lectures, discussions, and role playing emphasize topics that include ethics, roles, fees,

and Registry of Interpreters for the Deaf (R.I.D.) certification procedure. Laboratory work focuses on increasing skills in simultaneously interpreting English to sign language and vice versa.

36.207 Sign Language Interpreting III

(Formerly 19.212)

4 Q.H.

(Prereq. 36.206 or consent of instructor)

This course is designed for students who have completed the equivalent of Sign Language Interpreting I and II and wish to upgrade their skills. Laboratory work focuses on interpreting ASL into English and vice versa, and transliterating spoken English into manual English.

36.213 Methods and Materials in American Sign Language Instruction

(Formerly 19.213)

4 Q.H.

(Prereq. 36.204, 36.132, 19.154)

This course offers a study of the theories of second-language learning and teaching as applied to ASL, and existing approaches to ASL instruction, with focus on materials, activity selection, utilization and selection of instructional media, and evaluation techniques.

36.215 Deaf Culture

(Formerly 19.132)

4 Q.H.

(Prereq. 36.201)

Course focuses on the status of deaf people as a linguistic and cultural minority group. Topics include the role of American Sign Language in the Deaf community; educational and historical perspectives on deafness; and sociological and cultural make-up of the Deaf community.

36.290, 36.291, 36.292, 36.293, 36.294 Directed Studies

(each) 4 Q.H.

Directed Studies offer students an opportunity to go beyond course work of the regular curriculum or to pursue an individual learning project. May take the form of research, practice, or language development activity.

Speech Communication

37.102 Effective Speaking

(Formerly 29.102)

3 Q.H.

(Prereq. Industrial engineering students only; speech communication for specific purposes)

Designed to help provide the student with a basic understanding of the communication process and its function as a means of relating to the world, ourselves, and other people, the course examines factors in intra- and interpersonal communication, group communication, and public speaking through lectures, discussions, structured learning experiences, and written assignments.

37.106 Speech Fundamentals 3 Q.H.**(Formerly 29.106)**

(Prereq. Recreation majors only; speech communication for specific purposes)

This course is designed to give the student an opportunity to develop a basic understanding of the communication process and its function as a means of relating to the world, ourselves, and other people. It examines factors in intra- and interpersonal communication, group communication, and public speaking through lectures, discussions, structured learning experiences, and written assignments.

37.109 Effective Speaking Workshop 2 Q.H.**(Formerly 29.113)**

(Prereq. Civil engineering students only)

This course is designed to give the student an opportunity to acquire a basic understanding of the communication process and its function as a means of relating to the world, ourselves, and other people. It examines factors in intra- and interpersonal communication, group communication, and public speaking through lectures, discussions, structured learning experiences, and written assignments.

37.110 Voice and Articulation 4 Q.H.**(Formerly 29.110)**

The course includes the study of voice technique: emphasis on pitch, projection, articulation, and vocal variety. A combination of theory and practical application.

37.111 Oral Interpretation 4 Q.H.**(Formerly 29.111)**

The course focuses on application of basic vocal techniques to the dramatic reading of prose, poetry, and drama. Through literary analysis the author's meaning is understood and, by means of oral reading skills, communicated to an audience.

37.115 Introduction to Communication Skills**(Formerly 29.129)****4 Q.H.**

This course is designed to give the student an opportunity to develop a basic understanding of the communication process and its function as a means of relating to the world, ourselves, and other people. It examines factors in intra- and interpersonal communication, group communication, and public speaking through lectures, discussions, structured learning experiences, and written assignments.

37.116 Business and Professional Speaking**(Formerly 29.108)****4 Q.H.**

The course focuses on practice of oral presentations, group communication, conference and discussion techniques, interview methods, and occasion speaking. The course combines performance aspects with case study methods of communication on the professional level.

37.131 Introduction to Communication Theory**(Formerly 29.119)****4 Q.H.**

This course is designed to offer basic knowledge and understanding of the processes involved in the transference of meanings. From the problems involved in defining communication, through a discussion of the nature of communication, various models of communication are examined. The nature of theory and requirements of adequate theory are discussed, leading to an examination of various theories of human communication, including psychological, sociological, information, and system theories.

37.132 Rhetorical Theory I**4 Q.H.**

(Prereq. 37.115, 37.150)

This course examines various theories of rhetoric, starting with the early Greeks (Plato's "Phaedrus" and "Gorgias," Aristotle's "The Rhetoric"), progressing through the rhetoric of Rome (Cicero's "de Brute" and Quintilian's "de Institutione"), and moving into a brief synopsis of Medieval rhetoricians (Peter Ramus, Thomas Wilson, Thomas de Quincey, Francis Bacon, George Campbell, Richard Whately). The focus will be the student's growing knowledge and appreciation of the history and principles of rhetoric, which is the foundation of oral discourse.

37.150 Introduction to Mass**Communication****4 Q.H.****(Formerly 29.127)**

This is an introductory course designed to explore the many media through which people express themselves: radio, television, film, print, music. Attention is paid to the role of the individual as a media consumer.

37.151 Organizational Communication 4 Q.H.**(Prereq. 37.150)**

Organizational Communication examines the nature of communication in the context of complex organizations. The student will explore both internal and external organizational communication. Analysis of organizational communication will include: (a) communication networks, (b) communication technologies, (c) interpersonal communication modes, and (d) organizational interdependencies and their effect on information transfer and diffusion. The course will include a section on organizational communication assessment and communication program implementation.

37.212 Advanced Vocal Techniques**4 Q.H.****(Formerly 29.112)**

(Prereq. 37.110 or permission of instructor)

Development and application of vocal techniques acquired in 37.110. Emphasis on vocal analysis, flexibility, and regional patterns of speech.

37.214 Advanced Oral Interpretation 4 Q.H.
(Formerly 29.114)
 (Prereq. 37.111)

Opportunity to develop further oral reading skills acquired in 37.111. In addition, the course includes work with accents and dialects, study of reader's theatre, and an investigation of classical and modern philosophies of the art.

37.230 Interpersonal Communication I 4 Q.H.
(Formerly 29.141)

This is a conceptual, theoretical course designed to help increase awareness of the communication process. The course provides an examination of the ways in which we relate to other individuals and factors that influence these processes.

37.231 Interpersonal Communication II 4 Q.H.
(Formerly 29.142)

(Prereq. 37.230 or permission of instructor)

The course focuses on application of concepts developed in Interpersonal Communication I. It is an experiential course, exploring ways of becoming more aware of one's self and one's relationships with others and offering an examination of various options for communicating and increasing knowledge of the group process. Enrollment limited.

37.232 Female/Male Communication 4 Q.H.
(Formerly 29.143)

The course surveys the various dimensions of female-male relations as they are created, sustained, or disintegrated through communication transactions. Emphasis will be on the various images and stereotypes of male and female sexual identity as they affect and are affected by communication in the development of hostility, friendship, or intimacy. Temporary, permanent, and destructive female-male relations will be examined as they lead to alternate life styles.

37.233 Rhetorical Criticism 4 Q.H.
 (Prereq. 37.132)

This course focuses on the principles of rhetorical analysis: theories, methods, and the application of these to discourses. Various types of discourse will be studied throughout the quarter. Attention will be given to understanding various methods and problems in rhetorical analysis. Judgment criteria, as well as the role of rhetorical criticism in society, will be examined.

37.236 Theories of Persuasion 4 Q.H.
(Formerly 29.115)

The course surveys theoretical and conceptual approaches and research pertaining to the effectiveness of communication that is intended deliberately to induce changes in attitudes, beliefs, values, and/or behavior.

37.237 Persuasive Techniques 4 Q.H.
(Formerly 29.116)

(Prereq. 37.236 or permission of instructor)

The course offers a critical, in-depth analysis of instances of persuasion as they occur in social interaction, social movements, politics, and advertising; identification of practical strategies employed; and the factors that influence the effectiveness of those strategies when persuaders attempt to influence others.

37.238 Group Discussion 4 Q.H.
(Formerly 29.117)

Working in task groups, students are expected to explore theory and research in the area of group dynamics and to apply their knowledge to the classroom experience as they work on developing skills in decision making, problem solving, membership, and leadership.

37.239 Argumentation and Debate 4 Q.H.
(Formerly 29.105)

An applied course designed to help develop skills in rational decision making through advocacy. Attention is given to logical reasoning, psychological methods, and motivational techniques.

37.240 Contemporary Public Address 4 Q.H.
(Formerly 29.128)

The course offers a critical study of the public address of leading contemporary speakers representative of important political and social movements. This course seeks to help the student gain an appreciation of the dimensions and varieties of contemporary public address, broadly defined as symbolic discourse. From an understanding of various theories and approaches to public address, rhetorical situations are examined; the use of agitative and control strategies to accomplish social change is critically evaluated.

37.241 Theories of Audience Behavior 4 Q.H.
(Formerly 29.133)

Surveying theoretical models, concepts, and research, the course focuses on the role of the receiver as an active participant in the communication process. Topics include individual information processing; listening as a learned behavior; intra-audience effects; relations between media and audience characteristics; dissemination, rumors, and information; and the development of societal norms and mores.

37.244 Negotiation Skills 4 Q.H.

(Prereq. Middler standing or higher, or permission of instructor)

The skills involved in bringing matters to mutually acceptable settlements will be investigated and applied through lectures, discussions, and especially through performance in case studies and role-playing simulations. Classroom activities will include such personal, professional, and governmental

processes as conflict resolution, problem solving, and advocacy. Particular emphasis will be placed on the collective bargaining process in the private and public sectors, including negotiation, mediation, and arbitration.

37.250 Broadcast Production 4 Q.H.
(Formerly 29.144)

(Prereq. 37.150 or permission of instructor)

The course introduces the student to the equipment of a broadcast studio, surveys broadcast production techniques, and provides opportunities in class for applied practice through the production of programming suitable for broadcast.

37.252 Producing and Directing for Radio 4 Q.H.
(Prereq. Permission of instructor)

The course centers around the role of the producer/director in the creation, pre-production planning, and execution of local and network radio programs. Emphasis is on live broadcasts and live assembly of partially pre-recorded programs. A great deal of time will be spent on the written materials necessary for program planning. The class will spend some time in the studio working on model program production and, possibly, actual live music performance broadcasts.

37.254 Special Topics in Broadcasting 4 Q.H.
(Formerly 29.145)

(Prereq. 37.150 or permission of instructor)

This course introduces the student to the variety of roles played by broadcast professionals, and to the interplay of professional functions integral to the broadcast industry. The focus is on a different aspect of the broadcast industry each term.

37.270 Consultation Skills 4 Q.H.
(Formerly 29.140)

(Prereq. 37.131, 37.115, 37.230, and 37.238)

The course gives students the opportunity to acquire the skills necessary for analyzing communication difficulties in industry, organizations, and groups. The course includes theory, discussion, practice, and feedback, using a case study method.

37.271 Introduction to Communication Research 4 Q.H.
(Formerly 29.281)

(Prereq. 37.131 or permission of instructor)

The course provides an introduction to scientific method and epistemology as it applies to the investigation of communication phenomena. The course is structured to assist students in finding and critically evaluating literature dealing with factors that influence the effectiveness of communication and that may be pertinent to either academic projects or managerial decision making.

37.285 Special Topics in Speech Communication 4 Q.H.
(Prereq. Permission of instructor)

The course provides an in-depth examination of a subject of particular significance to the field.

37.290; 37.291 Directed Study (each) 4 Q.H.

37.295 Internship In Speech Communication 4 Q.H.

This course provides a student with the opportunity to gain academic credit for on-the-job training in an allied career field. Enrollment requires prior approval by a department committee, demonstration that the job allows opportunities to apply theoretical understanding to specific application in the work environment, and faculty advisement as well as on-the-job supervision.

93.130 Professional Practices: Individual and Social Dimensions 4 Q.H.

The course explores the dimensions and dilemmas of freedom and responsibility confronting professional people practicing within limits set by socio-economic conditions, by clients, and by other professionals. Case histories are examined to illustrate the dilemmas professionals face, the choices that are typically made, and the consequences these have on the freedom of the practitioner and on personal and professional integrity.

93.131 Introduction to Women Studies: Image, Myth, and Reality 4 Q.H.

This introductory course in the study of women in society encompasses the historical, political, economic, and social processes that have created both the image and the reality of women in contemporary society. An overview of the many different disciplinary approaches to the study of women.

93.175 Individual in Society 4 Q.H.

This team-taught course, offered jointly by the departments of Philosophy and Religion, Speech Communication, and Sociology, explores the dimensions and dilemmas of freedom and responsibility. The ways in which the self emerges and adapts itself in socially oriented communication processes (including verbal and nonverbal symbolic language) are discussed, especially as these relations exercise constraints on enlightened choice for both individuals and institutions.

93.176 Communication and Quality of Life 4 Q.H.

This course offers students an opportunity to develop a meaning of the concept "quality of life" and to gain knowledge of subjective and objective methods for measuring and assessing that concept. Problems in professions that influence quality of life are then identified, explored, and analyzed, and possible solutions evaluated.

Journalism

38.100 Interpreting the Day's News 4 Q.H.

Study of the news of the day and the function of the newspaper, news magazine, and news broadcasts in American life. Topics include rights and responsibilities of the press and how news is gathered, processed, and disseminated by the various media. For non-majors as well as majors.

38.101 History of Journalism 4 Q.H.

Development of American journalism from its European and English beginnings. Topics include: the colonial press, the great personal journalists of the nineteenth century, and the impact of major technological changes in mass communications media in the twentieth century. Some writing required.

38.102 Journalism Ethics and Issues 4 Q.H. (Prereq. 38.101)

Responsibilities of news media; ethical problems confronting decision makers in various journalistic fields; the principles found in codes of the American Society of Newspaper Editors, the Associated Press Managing Editors, the Society of Professional Journalists, and other organizations. Some writing required.

38.103 Fundamentals of Newswriting 4 Q.H. (Prereq. 30.103)

Functions of the editorial department and procedures in obtaining and writing news stories. Extensive practice in writing news.

38.104 Fundamentals of Newswriting 4 Q.H. (Prereq. 38.103 or permission of instructor)

Problems of reporting, interviewing, and news-writing with written assignments in various types of spot news reporting.

38.105 Techniques of Journalism 4 Q.H. (Prereq. 38.104 or permission of instructor)

Advanced practice in writing news stories, editorials, feature stories, criticisms, and other assignments.

38.106 Editing 4 Q.H. (Prereq. 38.104)

Practice in copy editing and headline writing. Assignments include keeping copy flow charts, photo selection and cropping, and page dummying.

38.107 Law of the Press I 4 Q.H. (Prereq. 38.106)

The meaning of freedom of the press, explored through study and discussion of the evolving First-Amendment interpretations of the United States Supreme Court.

38.108 Law of the Press II 4 Q.H. (Prereq. 38.107)

Legal problems of libel, slander, and invasion of privacy; the balance between private rights and the public's "need to know."

38.112 Magazine Writing 4 Q.H. (Prereq. 38.104)

Writing and free-lancing magazine articles;

analyzing magazines as markets; selecting the best feature format—how-to-do-it, profile, personal experience, human interest, interpretive pieces, and others.

38.120 Radio News Gathering and Reporting 4 Q.H.

(Prereq. 38.103)

Principles of writing and editing news for radio, with practice in interviewing, organizing news scripts, integrating audio materials into broadcasts, and on-air delivery.

38.121 Television Newswriting 4 Q.H. (Prereq. 38.103)

Writing for television news as opposed to writing for other news media; importance of the writer-reporter as field-producer and writer-producer; terms and language used in the production of TV news shows. Actual individual production of news shows; field trips to TV stations; guest lecturers from the TV news media.

38.122 Television News Production 4 Q.H. (Prereq. 38.104, 38.121)

Techniques used by the electronic journalist and the TV news producer. Students will have the opportunity to learn to build a TV news show based on studies of sight, sound, and motion derived from videotape, slides, photos, tape recorders, and other tools.

38.130 Advanced Reporting 4 Q.H. (Prereq. 38.105)

Investigative reporting techniques used by radio-TV, the daily press, wire services, suburban weeklies, and magazines.

38.132 Local Government Reporting 4 Q.H. (Prereq. 38.104)

Coverage of town/city government, with emphasis on the "beat" approach to reporting public affairs. Practical, in-the-field experience is emphasized in such projects as town meetings, meetings of boards of selectmen, and other commissions and bodies transacting public business.

38.135 Journalism and the Mass Media 4 Q.H.

Seminars featuring well-known professionals from major newspapers, radio-TV stations, wire services, magazines, photography, and public relations. An up-to-date, in-depth exploration of techniques and theories used in various media.

38.136 Public Relations Principles 4 Q.H. (Prereq. Junior standing)

Principles, history, and methods of public relations; processes of influencing public opinion; responsibilities of the public relations practitioner; analyses of public relations programs.

38.140 Design and Graphics 4 Q.H. (Prereq. 38.103)

Layout and design as applied to newspapers, magazines, and other forms of printed media. Analysis of copy, type, illustrative material, and

methods of blending them together effectively.

38.150 Advertising Principles 4 Q.H.

Development, procedures, economic functions, and responsibilities of advertising: planning, research, production, and other elements that go into successful advertising.

38.151 Advertising Copy Writing 4 Q.H.
(Prereq. 38.103, 38.150)

Theory and techniques of creating advertising copy for newspapers, magazines, radio, television, and direct mail. Fact gathering, copy structure, and advertising design are emphasized.

38.152 Advertising Practice 4 Q.H.
(Prereq. 38.151)

Preparation of advertising for print and broadcast media, including campaign planning and space and time buying and scheduling. Product research, consumer surveys, and measuring the effects of advertising.

38.160 Public Relations Problems 4 Q.H.
(Prereq. 38.136)

Application of public relations techniques to problems; case studies in industry, labor, education, government, social welfare, and trade associations.

38.161 Public Relations Practice 4 Q.H.
(Prereq. 38.103 and 38.136)

Practices and techniques employed in the field, including organization of events and functions.

Campaign planning, research, and media relationships are studied.

38.170 Seminar 4 Q.H.
(Prereq. Upperclass standing)

Discussions and readings on topics of current significance in various journalistic fields.

38.175 Publication Production and Management 4 Q.H.
(Prereq. 38.106)

Examination of the organizational structure, production methods, and management procedures of print media companies. Interaction of business, advertising, production, and circulation departments.

38.201 Basic Photojournalism 4 Q.H.
(Prereq. 38.103)

Camera and darkroom procedures will be covered along with cropping, assignment techniques, theory, and photo caption methods.

38.290 Honors in Journalism 4 Q.H.

38.291 Directed Study in Journalism 4 Q.H.

38.295 Honors in Journalism 4 Q.H.

(Prereq. Juniors and seniors only)

38.296 Honors in Journalism 4 Q.H.

(Prereq. Juniors and seniors only)

38.297 Honors in Journalism 4 Q.H.

38.298 Honors in Journalism 4 Q.H.

(Prereq. Juniors and seniors only)

Economics

Unless otherwise stated there are no prerequisites for advanced economics courses. Exceptions are made at the discretion of the instructor.

39.105 Principles of Economics 4 Q.H.

Topics include development of macroeconomic analysis; review of national income concepts; national income determination, fluctuation, and growth; role of the banking system and the Federal Reserve System; government expenditures and taxation; international trade; balance of international payments.

39.106 Principles of Economics 4 Q.H.

The course focuses on the role of the market pricing system of demand and supply in determining the allocation of resources to competing uses, and why this system may not function adequately in certain areas. Study includes the application of economic principles to private and public problems in such areas as pollution, poverty, and racial discrimination.

39.115 Principles and Problems of Economics I 4 Q.H.

The course offers an introduction to the conceptual aspects of economics; the flow of national income; economic growth and fluctuation; the role of money and banking; monetary and

fiscal policies. Emphasis is on assisting students in developing conceptual tools for use in the analysis of economic problems facing modern society.

39.116 Principles and Problems of Economics II 4 Q.H.

The course focuses on development of basic theory of demand, supply, and market price. Applications to selected microeconomic problems such as basic economics of monopoly and competition, poverty, race and discrimination, urban affairs, pollution, and other problems that relate to the role of the pricing system in resource allocation and income distribution.

39.130 Medical Economics 4 Q.H.

The course includes examination and discussion of the following topics: health-care trends in the United States; causes for increases in medical-care costs; supply and training of health-care personnel; the nation's need for physicians, nurses, pharmacists, and other allied health personnel; the quality of medical

care; economics of health insurance plans; consumer demand for health care; medical facilities; professional and semiprofessional personnel.

39.140 Economics of Crime 4 Q.H.

The course offers theoretical and empirical analysis of the economic causes of criminal behavior. The social costs of crime and its prevention will be covered; techniques for designing optimum law enforcement policies will be developed.

39.150 Economics of World Energy and Primary Resources 4 Q.H.

This course investigates economic, political, and historical backgrounds of the energy and other resources problems. Future impact of primary resources limitations on United States and world economics are analyzed. Feasibility studies of resource substitution.

39.155 Superpower Economics 4 Q.H.

This course offers an analysis of the relative economic structure and strength of the United States, the Soviet Union, Japan, the Common Market, and China, as well as the economic relations among these powers. The course also examines the impact of these relations on the domestic economies of the superpowers and of the developing nations of the world.

39.190, 39.191 Directed Study (each) 4. Q.H.

This course offers independent work under the direction of a member of the Department on a chosen topic. Limited to qualified seniors majoring in economics, with approval of Department.

39.241 Local Labor Market Analysis and Human Resource Planning 4 Q.H.

(Prereq. 39.115 and 39.116, or 39.105 and 39.106; 39.275 strongly recommended)

This course helps acquaint the student with a variety of methods and data sources for analyzing conditions in regional, state, and local labor markets to determine the extent, nature, and causes of human resource problems and to utilize that information in planning and designing appropriate employment and training strategies. Topics will include empirical analysis of state and local labor force developments, unemployment and poverty problems, the industrial and occupational composition of employment, wage structures, and trends in state and local income distributions, as well as methods for planning employment and training programs at the state and local levels.

39.242 Economics of Education and Training 4 Q.H.

(Prereq. 39.115 and 39.116, or 39.105 and 39.106; 39.279 strongly recommended)

This course provides a theoretical and empirical treatment of a variety of economic issues related to education and job training programs, including formal education (secondary and post-secondary), vocational education, on-the-job

training, and CETA-related employment and training programs. Emphasis will be placed upon the use of analytical techniques for determining the effectiveness of education and training investments from a private and social standpoint, including the design of follow-up studies, cost-effectiveness analysis, and benefit-cost analysis.

39.250 Statistics I 4 Q.H.

Topics include elementary set theory, basic probability, measurement and presentation of economic statistics, descriptive statistics, basic estimation techniques, testing statistical hypotheses and sampling problems.

39.251 Statistics II 4 Q.H.
(Prereq. 39.250)

Topics include analysis of variance, correlation and linear regression analysis, multivariate regression analysis, and Bayesian decision making.

39.253 Accounting Data for Social Scientists 4 Q.H.

(Prereq. 39.115 and 39.116, or 39.105 and 39.106, or permission of instructor)

This course is designed to familiarize non-accountants with the basic techniques and procedures of private and public accounting. Topics include developing and interpreting income statements and balance sheets, asset turnover, key accounting ratios, capital budgeting, cost flow analysis, and present-value determinations. The course also compares and contrasts the treatment of macro- and micro-accounting data.

39.254 Managerial Economics 4 Q.H.
(Prereq. 39.116 or 39.106)

This course emphasizes the application of economic principles and theory, by the use of case studies, to the solution of decision making problems in such areas as demand forecasting, price policies, estimation and control of costs, financing of capital investments, and responses to government taxation and regulation policies.

39.255 Microeconomic Theory 4 Q.H.
(Prereq. 39.106, 39.116, or equiv.)

A detailed study of supply-and-demand analysis, various elasticity concepts and applications, theory of consumer demand, theory of production, derivation of cost curves. Detailed analyses of pricing and output behavior in the several market structures with their welfare implications; the pricing of resources.

39.256 Macroeconomic Theory 4 Q.H.
(Prereq. 39.105, 39.115, or equiv.)

Investigation of the conceptual and empirical problems of creating and using national accounts; price index problems; conceptual and empirical evaluation of several consumption and investment functions and their policy implications; multiplier and accelerator models; a brief history of recent cyclical fluctuations. Theories

of inflation and growth are analyzed in the light of recent economic history.

39.259 European Economic Development 4 Q.H.
Economic inheritance of the nineteenth-century development of capitalism and laissez-faire. The aftermath of the Industrial Revolution, European overseas expansion, the twentieth century, the world wars, the dissolution of empires, American economic conquest and European integration, the future of less developed areas in southern Europe. Environmental impact of industrialism and the implications of technological society.

39.260 American Economic Development 4 Q.H.
Economic development of the United States from the colonial period to the present, historical changes in available factors, economic institutions and technologies, special attention to preconditions of industrialism. The American Industrial Revolution, its spread and socio-economic consequences. The Great Depression and the subsequent rise of mixed economy and welfare state; U.S. adjustments to postwar economic changes.

39.261 Economic History of Less Developed Countries 4 Q.H.
The problems of initiating and sustaining growth in selected third-world countries during the last two hundred years, with emphasis on traditional vs. contemporary economic development. Role of Western society, impact of technological and structural changes, relations between states and economic enterprises.

39.262 Government Expenditures: Structure and Evaluation 4 Q.H.
(Prereq. 39.106, 39.116, or equiv.)
Fiscal functions of government, fiscal institutions and politics, theory of social goods, public expenditure growth and structure, the federal budget expenditure evaluation and cost-benefit case studies, fiscal federalism in theory and practice.

39.263 Financing of Government: Taxation and Debt 4 Q.H.
(Prereq. 39.106, 39.116, or equiv.)
Principles of taxation; problems of tax structure and reform; major names at federal, state, and local levels; tax burden incidence; effects of taxation on economic efficiency and growth; negative income tax and social security finance; issues of public debt; public enterprise pricing; international tax coordination; taxation in developing countries.

39.265 Money and Banking 4 Q.H.
(Prereq. 39.105, 39.115, or equiv.)
The nature and function of money, credit, and monetary standards, and the role of our monetary and banking system in the economy. Topics include commercial banking, monetary theory and policy, the role and instruments of

the Federal Reserve System, and international monetary problems.

39.267 Economics of Urban Transportation 4 Q.H.
Transportation and land-use patterns; externalities; social costs and social benefits of various modes of urban transportation; ownership, regulations, and financing of various modes of transportation; economies of new technology in urban transportation.

39.268 Urban Economics 4 Q.H.
Study of urban growth and development, inter-metropolitan location of business firms, regional shifts in economic activity, intra-metropolitan location of firms and households, and land-use patterns.

39.269 Urban Economic Problems and Policies 4 Q.H.
Sequel to 39.268, Urban Economics. Economic analysis of selected urban problems such as housing, poverty, transportation, education, health, crime, and the urban environment. Discussion of public policies relating to such problems.

39.271 Social Control of Economic Activities 4 Q.H.
Development of the government's role in economic activities, examining the relation between the government and industry, labor, agriculture, public utilities, and consumers. The course will trace the changing role of the government from a laissez-faire policy to one of direct intervention in the economy. Current topics such as wage and price control, environment and antipollution policies, consumer protection, and conglomerate mergers will be discussed.

39.273 Industrial Organization and Public Policy 4 Q.H.
(Prereq. 39.255)
The theoretical framework for analysis and evaluation of the static and dynamic performance of real markets. An examination of the empirical studies testing the usefulness of applying theory to real markets. An examination of antitrust as a public policy designed to promote better market performances.

39.275 Labor Economics 4 Q.H.
Examination of the economics of the labor market and the labor force and of the institutions and policies dealing with them; employment, unemployment, wage determination, income distribution, and the development and efficient use of labor resources; development of trade unions; collective bargaining issues and their economic consequences.

39.277 Economics of the Quality of Urban Environment and Control 4 Q.H.
Economic analysis of air, water, thermal, and noise pollution; the utilization of urban space

and other urban resources; identification of possible economic effects of urban environment, such as crime, delinquency, immobility, and congestion.

39.278 Income Inequalities and Discrimination 4 Q.H.

Economic analysis of income inequalities and incidence of poverty. Examination of forces contributing to income inequality and poverty; economics of racial discrimination; public welfare system and other income maintenance schemes.

39.279 Employment and Training Programs and Policies 4 Q.H.

Objectives of employment and training programs; efforts to improve the labor market position of impoverished groups; economic evaluation of employment and training programs; planning for local labor markets and future needs.

39.280 Comparative Economics 4 Q.H.

Competing types of theoretical economic systems; analysis of organization and operation of currently existing types of communist, socialist, and capitalist economies; comparison and evaluation of economic behavior and performance of different economic systems.

39.281 Introduction to Mathematical Economics (Prereq. 39.115 or 39.105; 39.116 or 39.106; 10.105) 4 Q.H.

Functional analysis, matrix algebra, differential calculus and optimization—mathematics and elementary economic applications.

39.282 Mathematical Economics 4 Q.H. (Prereq. 39.281 or permission of instructor)

For economics, mathematics, business, and engineering students interested in a broad coverage of economic analysis using mathematical techniques as tools. Topics include models of the firm, demand theory, input-output, and other planning and policy models of the national economy.

39.283 Labor Market Position of Women and Sex Discrimination 4 Q.H.

Economic analysis of the labor market position of women in light of the changing structure of the economy of the United States and of the institutional setting. Analysis of female labor participation, unemployment, wage differentials, occupational concentration, and occupational segregation. Theories and evidence of sex discrimination. New opportunities open to women.

39.285 Development Economics 4 Q.H.

Prospects for economic growth and development in poor nations as indicated by economic analysis and historical experience: social, cultural, and institutional determinants of growth; analysis of agriculture and development, the role of technological change, population; and foreign trade.

39.286 International Economics 4 Q.H.

(Prereq. 39.106, 39.116, or equiv.)

Introduction to the theory of international trade and its role in resource allocation, implications of economic welfare, foreign exchange, the balance of payments mechanism, and problems of disequilibrium and adjustment.

39.288 Business Cycles and Inflation 4 Q.H.

(Prereq. 39.105 or 39.115; 39.106 or 39.116; 39.256)

A study of the theories of business cycles and inflation and an empirical application of these theories to current business cycle, inflation, and stagflation problems.

39.289 Advanced Economic Theory 4 Q.H. (Prereq. 39.255 and 39.256)

The course provides advanced theoretical treatment of selected topics in micro- and macro-economics. Recommended for students planning to take graduate economics.

39.291 Senior Economic Seminar 4 Q.H.

(Prereq. 39.255 and 39.256)

This is a course for senior economics majors, coordinating and applying economic concepts, methodology, and data to contemporary issues and problems of broad social, economic, and philosophical importance.

39.292 History of Economic Thought 4 Q.H.

This course provides comprehensive study in the development of economic thought. Coverage includes mercantilism as the first economic doctrine; analysis of older classical school, its later refinements (modern marginalism), and its important critics (socialists, Marxists); Keynesian and modern developments.

39.293 Introduction to Econometrics 4 Q.H.

(Prereq. 39.105 or 39.115; 39.106 or 39.116; and 39.251)

The course focuses on the methods of econometric estimation and forecasting. Coverage includes topics in various statistical techniques. Students are given the opportunity to construct their own models and use computer facilities for estimation and forecasting.

39.294 Problems In Economic Research 4 Q.H.

(Prereq. 39.105 or 39.115; 39.106 or 39.116; 39.251)

This course examines research methods of practicing economists with typical problems from applied areas of economics and choice of modeling framework; problems of data collection, review of estimation techniques and interpretation of results; development of static and dynamic adaptive policy models.

39.295, 39.296, 39.297, 39.298 Junior-Senior Honors Program (each) 4 Q.H.

For prerequisites and other details, see the section on the Junior-Senior Honors Program on page 5.

Accounting

41.111 Accounting Principles I

4 Q.H.

This first of a series of accounting courses assumes students do not possess knowledge of the subject. Both this course and 41.112 are designed to help provide an understanding of accounting issues and objectives for proper interpretation and analysis of financial data. Specific topics covered in this first course are: 1) the nature, function, and environment of accounting; 2) the basic accounting model; 3) financial and analytical ratios; 4) the accounting cycle; 5) accounting for merchandising entities; and 6) the control of cash and receivables.

41.112 Accounting Principles II

4 Q.H.

(Prereq. 41.111)

The second of a series of accounting courses. Students are introduced to financial and managerial accounting decisions through class discussions, short exercises, and demonstration problems. Specific topics covered include: 1) control of inventory; 2) acquisition, depreciation, and disposal of plant and equipment; 3) paid-in capital related to sole proprietorships, partnerships, and corporations; 4) short- and long-term debt financing; 5) the analysis and interpretation of financial reporting; and 6) the statement of changes in financial position.

41.118 Principles of Accounting

8 Q.H.

This course covers the content of courses 41.111 and 41.112 and is primarily intended for transfer students.

41.205 Cost Accounting for Management

4 Q.H.

(Prereq. 41.112)

This course offers an examination of cost accounting from a managerial viewpoint. The impact of quantitative and behavioral aspects on budgets and cost control is stressed. This course is designed specifically for management majors.

41.210 Introduction to Accounting —

A. & S.

4 Q.H.

(Not open to College of Business Administration students)

Specifically for arts and sciences majors, this course is designed to help provide a fundamental knowledge of accounting to students who do not expect to become accountants but would like the opportunity to learn to understand, interpret, and make use of accounting data. The course surveys the foundations of accounting and the role it plays in the management of the profit and nonprofit sectors of the American economy.

41.251 Intermediate Accounting I

4 Q.H.

(Prereq. 41.112 or equiv.)

The principal foundation course for accountants begins with a comprehensive review of basic accounting principles, operations, and financial

statements. Development of accounting theory is stressed in the analysis of alternative treatments and procedures. Specific areas receiving intensive treatment are cash, accounts receivable, inventories, and current liabilities.

41.252 Intermediate Accounting II

4 Q.H.

(Prereq. 41.251)

This course is a continuation of the study of accounting principles, concepts, and procedures. Specific topics emphasized are long-term assets, depreciation, stockholders equity, and EPS.

41.253 Cost Accounting I

4 Q.H.

(Prereq. 41.112)

This course examines cost determination and use. Special consideration is given to manufacturing concerns. Specific coverage includes cost behavior, relevant costs, performance evaluation, budgets, and standard costs.

41.254 Cost Accounting II

4 Q.H.

(Prereq. 41.253)

This course is a continuation of 41.253 (Cost Accounting I) and gives special attention to the use of cost data in decision making, budget planning, and the control process.

41.255 Intermediate Accounting III

4 Q.H.

(Prereq. 41.252)

This course completes the study of basic accounting concepts and covers special areas of concern to modern accounting practice. Leases, pensions, accounting changes, income tax accounting, changes in financial position, price-level and current-value accounting are studied.

41.257 Auditing

4 Q.H.

(Prereq. 41.255)

Designed for the student who plans to enter the public accounting profession, this course examines audit concepts, standards, and procedures, including the auditor's legal and ethical responsibilities. Emphasis is on concepts rather than procedures. Specific areas covered are auditing standards, auditor's reports, internal control, statistical sampling, EDP, and legal liability.

41.260 Federal Income Taxes I

4 Q.H.

(Prereq. 41.255 or 41.112)

This course stresses basic understanding of the federal income tax structure relating to individuals rather than to corporations. Students are required to complete several research cases directed at solving various tax problems. Case studies introduce the student to the current Internal Revenue Code, income tax regulations, and cumulative bulletins. Tax court cases and various private company publications are discussed.

41.262 Accounting Theory and Practice 4 Q.H.

(Prereq. 41.255)

Objectives are to examine: 1) the theory and practice of corporate financial reporting and some of the controversial areas in accounting; 2) the pronouncements and research studies of the authoritative institutions of the profession relating to the practice of accounting; 3) the textual and periodical literature on accounting theory.

41.263 Accounting Planning and Control 4 Q.H.

(Prereq. 41.254)

This course provides an examination of the role of management planning and control systems and problems inherent in their design and use, and defines the process of identifying factors in the design of these systems.

41.264 Advanced Accounting Problems 4 Q.H.

(Prereq. 41.255)

This course is an in-depth analysis of various accounting topics for the student planning a career as a professional accountant. Topics covered are government and not-for-profit accounting; partnerships; installment sales; consignments; segment and interim reporting; foreign currency accounting; troubled-debt restructurings; and liquidations, estates, and trusts.

41.265 Management Accounting 4 Q.H.

(Prereq. 41.263)

This course examines the role of the management accountant. Topics include relation between financial and managerial accounting, design and use of accounting and control systems, measurement techniques and uses, the role of behavior in accounting, performance evaluation, and other topics of current interest.

41.269 Advanced Accounting Problems II 4 Q.H.

(Prereq. 41.255 or permission of instructor)

This course is a comprehensive analysis of the accounting theory and practice associated with corporate acquisitions and combinations. Topics include methods of consolidation-elimination of profits on intercompany transac-

tions, purchase versus pooling of interests, and accounting for good will. The course is intended for the serious student preparing for a career as a professional accountant.

41.272 Internal Auditing 4 Q.H.

(Prereq. Middler standing)

This course is designed to aid students in understanding how the internal auditor undertakes a review and appraisal of operations. Study will focus on the internal audit environment, preparation of long-range programs, the performance of preliminary surveys, flowcharting, the development of audit programs, sampling, audit techniques, and reporting. The course is case-study oriented.

41.273 Federal Income Taxes II 4 Q.H.

(Prereq. 41.260)

This course is a continuation of 41.260 (Federal Income Taxes I), focusing on taxpayers other than individuals and the treatment of those property transfers subject to federal, gift, estate, and trust taxes. Tax research is an important element of this course. A major emphasis is given to tax planning considerations, especially to gift and death tax consequences.

41.274 Accounting Systems 4 Q.H.

(Prereq. Middler standing)

This course examines the process of designing both financial and managerial accounting systems. The approach is conceptual, and the course considers the use of computer technology in designing new systems where computers are appropriate. The course assumes an understanding of accounting processes in both financial and managerial areas.

41.275 Computers in Accounting and Auditing 4 Q.H.

(Prereq. 41.257 or 41.272)

This course examines the use of computers in accounting and auditing. Topics include systems design and applications in accounting, internal control of computer-based systems, computer audit and control guidelines, and EDP audit tools and techniques.

Marketing

43.120 Introduction to Marketing 4 Q.H.

(Prereq. Middler standing)

This course consists of lectures, readings, and small-group discussions on the role of marketing in contemporary society, in the business enterprises, and in the nonprofit organization. Consideration is given to the planning, operation, and evaluation of marketing and promotional efforts necessary to the effective marketing of consumer and industrial products and services in both profit and nonprofit organizations.

43.122 Workshop in Negotiations 4 Q.H.

(Prereq. Junior or senior standing)

The objective of this course is to aid students in improving their understanding of the negotiations process and their ability to plan and conduct negotiations effectively. Class activities involve readings, lectures, and discussions, as well as numerous case discussions and live and videotaped role-play negotiation exercises.

43.228 Marketing for Nonprofit Organizations 4 Q.H.

(Prereq. Middler standing)

This course examines the unique characteristics of marketing in public and nonprofit enterprises.

It aims to expand the scope of marketing management concepts beyond the traditional setting of business. Particular attention is paid to the basic decision-making differences between public and private firms. The course involves case analysis, assigned readings, and a group project.

43.235 Marketing Channels 4 Q.H.
(Prereq. 43.120, or permission of instructor and junior or senior standing)

This course studies marketing structures and institutions: their evolution, functions, interrelations, and the management of their role in the marketing process.

43.236 Retail Merchandising and Control 4 Q.H.
(Prereq. 43.120 or permission of instructor)

This course examines the concepts and techniques of store operations and merchandise management. Topics such as calculating and planning markups and markdowns, pricing, inventory control, stock turn, open-to-buy, profitability analysis, and expense control are considered.

43.237 Retail Strategies and Problems 4 Q.H.
(Prereq. 43.120; junior or senior standing or permission of instructor)

This course considers strategic and policy decisions of major retail enterprises engaged in food, apparel, and general merchandise distribution. The evolution of retail institutions is analyzed along with the characteristics of and prospects for new store types.

43.240 Marketing Research 4 Q.H.
(Prereq. 43.252)

This course focuses on the survey research process and the analysis of data using "canned" computer programming routines. Among the topics covered are: 1) problem definition, 2) research design, 3) sampling techniques, 4) questionnaire development, 5) data collection methods, and 6) data analysis. Students are expected to work on group projects with participating firms. No previous computer experience required.

43.242 Sales Management 4 Q.H.
(Prereq. 43.252)

This course is designed to help the student develop decision-making skills necessary for both building and maintaining an effective sales organization. Cases and readings are used to examine the strategic and operating problems of the sales manager. Major topic areas include the selling function, sales management at the field level, and the sales executive.

43.244 Quantitative Methods in Marketing 4 Q.H.
(Prereq. 49.251)

This course focuses on statistical methods and techniques commonly used in the analysis and interpretation of survey and experimental data. "Canned" computer programs will be used ex-

tensively to illustrate the applicability of the methods discussed. No previous computer experience required.

43.252 Marketing Management 4 Q.H.
(Prereq. 43.120)

This course is designed to provide training in marketing decision making. Case studies simulating actual business settings are used to help students develop analytical abilities and sharpen their communications skills. Topics covered range from techniques used to analyze a market to the development of a total marketing strategy (product policy, pricing policy, promotion policy, and distribution policy).

43.261 International Marketing 4 Q.H.
(Prereq. 43.120)

This course is designed to help familiarize the student with those aspects of marketing that are unique to international business within the framework of traditional functional areas of marketing. The focus is on the environment and the modifications of marketing concepts and practices necessitated by environmental differences. Topics include cultural dynamics in international markets, political and legal environmental constraints, educational and economic constraints, international marketing research, international marketing institutions, and marketing practices abroad.

43.262 Advertising Management 4 Q.H.
(Prereq. 43.252)

This course focuses on the management of the advertising function in relation to a firm's overall marketing objectives. The course approaches the subject from the perspective of the user of advertising (e.g., product manager, marketing manager). Case studies and text material are used to help the student develop decision-making skills.

43.265 Industrial Marketing 4 Q.H.
(Prereq. 43.252)

This course examines the marketing of products where business firms are the potential customers. Upperclass elective, open to juniors and seniors.

43.266 Marketing in the Service Sector 4 Q.H.
(Prereq. 43.120)

The course provides a basic treatment of methods and techniques for marketing in the service sector, which includes sports, recreation, public service, banking, insurance, and hotels. In addition to the principles covered, a number of descriptive studies will be analyzed covering the application of such marketing principles in key service areas.

43.271 New Product Development 4 Q.H.
(Prereq. 45.112)

For most firms, coping with the problems of environmental change through modification of the product line is both vital and difficult. This

seminar is concerned primarily with the examination and analysis of the problems firms face in directing and managing their new product development activities.

43.275 Foundations of Consumer Behavior

4 Q.H.

(Prereq. 43.252)

This course is concerned with helping students develop an understanding of consumer attitudes and behavior processes as the basis of the design of marketing problems. Consideration is

given to economic and behavioral models of consumer behavior and to underlying behavioral theories and concepts.

43.278 Competitive Strategy

4 Q.H.

(Prereq. 43.252)

A capstone marketing course, required of all students with a marketing concentration. The focus is on the formulation of marketing strategy at a policy level and its implementation in a dynamic environment.

Finance and Insurance

44.120 Introduction to Finance

4 Q.H.

(Prereq. 41.111, 41.112, and middler standing)

The objective of this course is to acquaint students with basic processes, principles, tools, and concepts of finance. Topics include financial analysis, financial forecasting, profit planning, budgeting, working capital management, and capital budgeting. The course also covers the basics of financial markets, institutions, and sources of supply of different types of funds available to a firm.

44.122 Taxes and Financial Decisions

4 Q.H.

(Prereq. 39.105 and middler standing)

In this course, the case method is used to discuss a number of financial decisions that are greatly influenced by tax considerations, the most important of which are concerned with capital structure, dividend policy, acquisition terms, investment policies, and liquidations. The federal income tax receives primary consideration, but state and foreign taxes are also discussed.

44.126 Bank Management

4 Q.H.

(Prereq. 44.120 and 44.275)

This course deals with the financial management of commercial banks and thrift institutions. The problems of liquidity and investment management, loan portfolio and capital management, and pricing problems associated with various sources and uses of funds are analyzed in the context of changing economic and regulatory environment for these institutions. The course is conducted through lectures, discussions, and cases.

44.127 Seminar in Option Markets

4 Q.H.

(Prereq. 44.120 and 44.275)

While puts and calls have been traded for many years, a market for listed options only appeared in 1973. Trading options on exchanges made such activity much easier and opened many more opportunities for both speculation and the protection of security positions. The purpose of this seminar is to explain the basic mechanics of this market, the characteristics of puts and calls,

the techniques that may be applied, and current developments in the field. Students will be required to do individual research related to current methodology and concepts. Some knowledge of money and capital markets, as well as corporate finance, is necessary for those taking the course.

44.130 Seminar in Financial Futures

4 Q.H.

(Prereq. 44.120)

This is a seminar in commodity futures markets centered in the area of financial futures, with special emphasis on interest rate futures. The course covers the methods of trading, margins, hedging, spreading futures contracts in treasury bills, commercial paper, treasury bonds, treasury notes, GNMA's, etc. Students prepare a seminar report on some aspect of the futures market.

44.144 Management of Financial Institutions

4 Q.H.

(Prereq. 44.120)

This course offers a broad study of the decision-making problems faced by financial institutions such as commercial banks, savings and investment institutions, and finance companies when viewed as competitive, profit-seeking business entities. Topics include the nature and scope of the capital markets confronting institutions, specialized problems regarding the sources and uses of funds of financial institutions, the nature of competition, the regulation of financial institutions, and strategic policy planning of financial institutions.

44.145 Securities Markets

4 Q.H.

(Prereq. 44.120)

This course aims to analyze the operation of the securities market. Striking a balance between descriptions analysis, the course provides students the opportunity to examine in detail the operation and function of investment bankers, broker-dealers, and securities exchanges. There is a thorough study of the mechanics of cash and margin accounts, trading options, and regulations affecting securities markets.

44.154 Managerial Finance 4 Q.H.
(Prereq. 44.120)

The objective of the course is to provide students the opportunity to gain knowledge of the advanced tools and concepts used in the management of funds. Topics include inventory and credit policies, risk, capital budgeting, financial structure, cost of capital, dividend policy, and valuation of a firm. Overall financial strategy and timing of its implementation are also examined. Specialized topics—mergers and acquisitions, financial failure, and financial policy for multinational firms—may be considered in the course.

44.159 Small Business Finance 4 Q.H.
(Prereq. 44.120)

This course utilizes the basic processes, principles, tools, and concepts of finance within the parameters of a small business to develop a complete financial plan that projects the future circular flow of funds by analyzing and then integrating the impact of both investment decisions (use of funds) and financial decisions (source of funds).

44.160 International Financial Management 4 Q.H.
(Prereq. 44.120)

This course introduces students to the international financial environment. Subjects include balance of payments, exchange rates, Eurocurrencies, foreign capital markets, etc. The financial policies and practices of companies involved in multinational operations are considered. Specific topics include capital budgeting; capitalization policies, the use of Eurocurrency and Eurobond markets, and foreign exchange risk management by the international firm.

44.162 A Risk Management Approach to Property and Casualty Insurance 4 Q.H.
(Prereq. 44.120)

The concepts of risk, uncertainty, risk management, and insurance are introduced. A comprehensive analysis of property and casualty insurance markets and products is presented from a buyer's perspective. Principal emphasis is placed on defining and analyzing alternative methods of treating risk in a business enterprise. The course discusses different risk management strategies and analyzes practical situations.

44.171 Real Estate Finance Analysis and Investment 4 Q.H.
(Prereq. 44.120)

This course provides students with a comprehensive overview of real estate finance. Factors affecting real estate investment are emphasized. Specific topics covered include: valuation (appraisal), market analysis, development, owner-

ship types, short-term financing, mortgage markets, the impact of inflation on real estate investment and finance, and investment strategies. The course is designed for students interested in a general overview of real estate finance, as well as those intending to pursue further studies in real estate. Instruction is primarily through readings, lectures, and case discussions.

44.172 Entrepreneurial Decision Making in Real Estate 4 Q.H.
(Prereq. 44.171)

This course provides an overview of property acquisition, development, and management from an entrepreneurial perspective. Topics include planning, financing, cost control and management of construction, marketing, and joint ventures. All major land uses are considered. Instruction is primarily through lectures and case discussions. Some class sessions may be devoted to guest speakers from the real estate community.

44.173 Real Estate Finance and Investment Strategies 4 Q.H.
(Prereq. 44.171)

The objective of this course is to provide students the opportunity to acquire knowledge and skills for decision making in the context of organizational real estate investment strategies. Five general topical areas are covered: 1) measurement of risk and yield on real estate debt and equity investments; 2) comparison of the risk and return in real estate investments with other types of investments; 3) traditional and innovative financing techniques; 4) management of a real estate portfolio; and 5) development and implementation of real estate investment strategies. Instruction is primarily through lectures, readings, and case discussions.

44.181 Investment Management 4 Q.H.
(Prereq. 44.120 and 49.251)

This course offers a broad overview of the concepts, practices, and procedures of investment management. Areas covered include basic security types, security market operations, security analysis (both fundamental and technical) and an introduction to portfolio management.

44.185 Long-term Financial Management 4 Q.H.
(Prereq. 44.120 and 44.154)

This course focuses on several phases of long-term finance. Particular attention is devoted to complex cases dealing with capital budgeting, new financing, and mechanisms (both public and private) used to raise long-term funds.

44.221 A Risk Management Approach to Employee Benefit Programs 4 Q.H.
(Prereq. 44.120)

The concept of risk management is employed to develop a framework for a systematic treatment

of employee benefit programs. The risks associated with the employee are defined, methods used by an employer to handle these risks are reviewed, and the concept of cost minimization of employee benefit programs is introduced. Private insurance, Blue Cross/Blue Shield, and government programs are viewed as alternative financing mechanisms of employee benefit programs, and the benefits and costs of these institutional arrangements are discussed.

44.240 Personal Finance 4 Q.H.
(Not open to College of Business Administration students)

The course focuses on management of the total personal estate: budgeting, savings, insurance, investments, borrowing, taxes, Social Security, pensions, annuities, securities markets, mutual funds, and their integration.

44.241 Personal Financial Management 4 Q.H.
(Prereq. 44.120)

The course places emphasis on the development of personal financial management expertise based on an integrated plan for personal choices in which alternative courses of action are judged by their contribution to the attainment of the decision maker's particular set of economic objectives. The overall personal economic plan is the consistent focus of the course and unites such diverse topics as inflation and investment selection, insurance, short- and long-run hedges against the purchasing power risk, purchasing assets, etc. The course is decision oriented and attempts to expose students to alternative courses of action and lead them toward a rational solution by developing techniques of estimating the success probabilities of alternative methods.

44.246 Essentials of Finance and Investments 4 Q.H.
(Prereq. Middled standing; non-business students only)

A survey of the scope and nature of business finance and investment management. Topics include financial analysis, budgeting, and capital expenditure decisions. An overview of financial markets is presented. Stocks, bonds, and other financial instruments are discussed, both as a source of funds for businesses and as investments for individuals and institutions. Techniques of security analysis and portfolio management are introduced.

44.275 Money and Business Activity 4 Q.H.
(Prereq. Middled standing)

The course aims to provide students an understanding of the financial environment faced by a firm as well as the financial institutions serving the economy. The course discusses the forces that determine the changes in money and capital markets and explores the implications of changing financial environment for the management of funds in a firm and/or financial institution.

44.291 Seminar in Finance Theory 4 Q.H.
(Prereq. 44.120 and 44.154)

The course involves a discussion of the different theories related to the financial policies of business organizations and an analysis of the contributions of various theorists in finance. It covers topics such as debt capacity, capital budgeting under uncertainty, cost of capital, dividend policy, and the capital asset pricing model. The policy implications, limitations, and underlying assumptions of various theories are incorporated into the course.

44.292 Honors Seminar in Finance Theory 4 Q.H.
(Prereq. Participant in Honors Program only)
See Course Description for 44.291.

44.294 Modern Portfolio Management 4 Q.H.
(Prereq. Honors participant or permission of instructor)

The course seeks to analyze the methods of selection, revision, and performance measurement of asset portfolios. The student will be exposed to the current and most modern methods of asset portfolio building used in business today. The concept of an efficient frontier of assets in the risk-return space will be presented and evaluated. The efficient frontier theory is used to identify the gains available from diversification and to select those securities or assets that best contribute to the goals of the portfolio. Included in the course is a simulated equity fund management project. An efficient portfolio-building software package is available to the students to help them in their analysis. Each student must initially select a number of equity securities to satisfy the stated objectives of his/her fund. At the end of the course the student must prepare and present an annual report evaluating the portfolio's construction and performance, with recommendations for revision. The course requires the student to bring a core knowledge in the areas of statistical analysis, accounting methods, and basic finance theories.

Management

45.106 International Labor Relations Systems 4 Q.H.
(Prereq. 45.210)

This course analyzes the labor relations systems of selected countries in comparison with that of the United States. The political, cultural, and economic forces that shaped these systems are also studied. Special attention will be given to such international institutions as multinational companies and the EEC. There will be cases, readings, and projects assigned.

45.112 Business Policy 4 Q.H.
(Prereq. 45.210)

This course focuses on corporate strategy and its elements, including an analysis of the com-

pany, its resources, opportunities, environment, and decision makers. Emphasis is on decision making and implementation of strategy while operating a company in the context of a business simulation.

45.130 Opportunity Analysis and Venture Capital 4 Q.H.

(Prereq. 45.212 or permission of instructor)

This course is concerned with the essential tasks performed prior to establishing a new venture. These include finding a suitable business opportunity or developing an idea for a product or service; analyzing the feasibility of the opportunity or idea; developing a business plan; structuring the venture team; seeking sources of seed capital; and forming a venture action plan for beginning operations.

45.160 Operations Planning and Control 4 Q.H.
(Prereq. 45.265)

This course focuses on the planning and control necessary for an enterprise to respond to customer demand. Specific topics include the design of the planning and control system, inventory planning and control, forecasting for operations planning, and operations scheduling.

45.209 Organization Behavior 4 Q.H.
(Prereq. Middler standing)

This course explores the effects of individual, interpersonal, group, and leadership factors on human behavior. Managerial applications of behavioral and social science concepts are also explored, including job design, job satisfaction, performance appraisal, supervision, career dynamics, and organizational change. Emphasis is placed on helping the student develop skills in dealing with the human side of enterprise.

45.210 Complex Organizations 4 Q.H.
(Prereq. Middler standing)

The course examines the structure and dynamics of the complex organization. Focus is on the design of the organization and its basic sub-systems (reward, control, selection, development). Students have the opportunity to explore how organizational structures help shape human behavior. Emphasis is on understanding the interrelations among organizational structures, tasks, and individual characteristics within the context of a changing environment.

45.212 New Venture Creation: A Career Choice 4 Q.H.
(Prereq. Middler standing)

This course is designed to assist students interested in small business in answering a number of important questions through a systematic analysis of their own potentials for entrepreneurial careers: What is involved in starting my own business? What is my own entrepreneurial orientation and commitment? What managerial and behavioral skills do I need for achievement? How can I plan for my personal and entrepreneurial goals? Case discussions,

self-assessment, goal-setting exercises, guest speakers, and a student-selected project are used.

45.216 Managerial Skills Seminar 4 Q.H.
(Prereq. 45.210)

This course offers a study of the nature of managerial work focusing on three key managerial roles—interpersonal, informational, and decisional. Behavioral determinants of administrative effectiveness are examined with an emphasis on the practical implications of and personal orientations to those key managerial roles.

45.218 Motivation and Control 4 Q.H.
(Prereq. 45.210)

This course provides an extensive analysis of various theories of motivation, including Herzberg's two-factor theory, expectancy theory, learning theory, need theory (McClelland), and competence motivation. This course also considers the behavioral implications of various organizational systems of measuring and controlling operations.

45.220 Managing Human Resources for the Non-business Student 4 Q.H.

This course applies concepts from the behavioral and social sciences to the problems of managing human resources in the workplace. Specific topics include motivation, communication, interpersonal behavior and conflict resolution, leadership, group behavior, and organizational change. In addition, particular current techniques in human resources management will also be explored, including performance management, career management, and career development.

45.250 Business and Society 4 Q.H.
(Prereq. 45.210 and junior standing)

This course offers an analysis of environmental influences—economic, legal, technical, social, cultural, and ethical—affecting the corporation. The focus is on managerial decision making and relieving the tensions generated by these external factors.

45.263 Career Exploration and Self-Assessment 4 Q.H.
(Prereq. 45.210)

This course examines the tools for both self-assessment (investigating one's skills, abilities, needs, values, and interests) and career exploration (determining the nature of and requirements for entering and succeeding in various career fields). The goal of the course is to help students develop an individualized plan of action that summarizes a wide variety of data indicating an individual's present status and career goals, and the means by which to bridge the gap.

45.265 Operations Management 4 Q.H.
(Prereq. 49.251)

Operations Management is concerned with the

productive system of an enterprise whereby inputs of technology, materials, personnel, and information are transformed into useful goods and/or services. The principal objective of this course is to introduce the student to the types of problems and issues encountered by the operations manager. Various models and techniques will be discussed, but the emphasis is on problem formulation and managerial implications.

45.267 Strategies of Organizational Changes

4 Q.H.

(Prereq. 45.210)

This course focuses on three basic areas: (1) organizations as stable systems that naturally resist both planned and unplanned change; (2) organizations as dynamic systems that continuously respond to both internal and external pressures for change; and (3) strategies and techniques for designing, implementing, and managing change. The role of the change agent will be discussed in this context.

45.268 Assessment of Prospective Employees

4 Q.H.

(Prereq. 45.209)

The course examines three influences of employee selection and testing: first, the legal aspect of selection, where the greatest uncertainty is found; second, the influence of industrial psychology on selection and decision-making techniques; and third, the area of personnel practices itself, that is, the methods employers find effective in coping with legal requirements. Basic issues and procedures such as EEO, decision strategies, and the utility and evaluation of selection and appraisal systems will be covered.

45.269 Interpersonal Relations Through Transactional Analysis

4 Q.H.

(Prereq. 45.210)

Using a simplified behavioral vocabulary, Transactional Analysis becomes a language and way of thinking about the nature of interpersonal relations. As an applied skill, transactional analysis may help teach one how to improve communications and relations between individuals. Transactional analysis has been used as a training technique by dozens of companies in such areas as improving the interpersonal skills of customer-contact personnel, implementing affirmative action programs, and improving superior-subordinate relations.

45.272 People and Productivity: Human Resources Management

4 Q.H.

(Prereq. 45.209)

This course is designed to help students develop understanding of contemporary issues in human resource management. Problems posed by changing work patterns, labor force char-

acteristics, union activities, and government policies are examined. Organizational experiments such as worker participation, job enlargement, and group incentives are discussed and evaluated from a managerial perspective.

45.273 Personnel Administration

4 Q.H.

(Prereq. 45.210)

This course explores basic traditional personnel functions, with an emphasis on the role of the personnel specialist. Functions include recruitment, selection, placement, training, and development of employees, as well as reward systems such as money and promotions. The recent challenge of new regulatory systems, such as affirmative action and occupational safety and health, on employment planning will be covered.

45.274 Contemporary Labor Issues

4 Q.H.

(Prereq. 45.210)

The course provides a study of current issues dealing with labor in its broadest sense. Labor unions and manpower institutions as well as the emerging development and training problems motivated by unemployment, poverty, and changing work patterns are discussed. Recent legislation dealing with the employment relationship is reviewed.

45.275 Labor Law

4 Q.H.

(Prereq. Middler standing)

The purpose of this course is to help acquaint the student with the many constitutional and legal problems involved in labor organizing, industrial relations, labor negotiations, labor contract enforcement, and dispute resolution. Cases are studied for the legal principles underlying the common law, state and federal laws, and the constitutional questions of power and authority. The Sherman Act, Clayton Act, Norris-LaGuardia Act, and Labor Management Relations Act are considered.

45.276 Seminar in Collective Bargaining

4 Q.H.

(Prereq. 45.210)

The course focuses on the organization, negotiation, and administration of collective-bargaining relations between management and unions in different industries, services, and levels of government. Simulations of actual bargaining and an arbitration exercise are also a part of the course.

45.277 Reward Systems: Wage, Salary, and Benefits Administration

4 Q.H.

(Prereq. 45.210)

This course examines one of the major functions of personnel administration—compensation management—and its part in the overall personnel programs of the organization. The analysis of reward systems as supportive mechanisms of management and the formulation of compensation policy and implementation

of compensation systems are developed through simulation exercises and group projects, as well as lectures and cases.

45.278 Leadership 4 Q.H.
(Formerly 45.258, Dynamics and Practice of Superior-Subordinate Relations)
 (Prereq. 45.210)

This course offers a study of the leadership function in a variety of organizational settings. Using a contingency approach, this course explores a range of possible leadership behaviors, relating the appropriateness of a particular style to a number of situational factors. Readings provide an opportunity to explore several contingency theories of leadership; cases allow for the application of these models; and videotaped role playing and self-assessment techniques permit the student to evaluate his/her own leadership style.

45.279 The Changing Workplace: An On-Site View of Industrialization 4 Q.H.
 (Prereq. 45.210)

America, and New England in particular, is noted as the place where the genius of industrial innovators and managers brought the industrial revolution to its first real flowering. This course deals in depth with the interactions of technical, economic, social, and managerial factors as they evolved in forming industrial New England. Emphasis is on the nineteenth century although forces will be traced from colonial New England to the present. Focus is on the participants in this dynamic free enterprise process—the managers and workers—and the settings in which they worked and lived. The seminar format includes on-site studies of factory settings, mill reconstructions, museums, and the communities in which developments took place. The seminar also includes films, lectures, and individual tutorials. Each student is required to complete a research project.

45.284 Seminar in Business — Government 4 Q.H.

The seminar is a research oriented course in which students have the opportunity to explore the topic of business-government relationships. The course is conducted within the framework of a competition by General Motors Corporation. A series of topics will be researched and several reports produced. These will be merged into a single report which will serve as the basis for a group presentation to General Motors representatives who will come to Northeastern for this purpose. Prior presentation will be given by students to interested faculty and members of the administration. Grading will be based primarily on final reports and interim reports as well as proposals from groups.

45.285 Honors Seminar in Business — Government 4 Q.H.
 (Prereq. Open to honors participants only)
 See course description for 45.284.

45.288 Honors Course — The Changing Workplace: An On-Site View of Industrialization 4 Q.H.
 (Prereq. Open to honors participants only)

45.288 Seminar on the Management of Innovation 4 Q.H.
 (Prereq. Honors participant or permission of instructor)

The management of technological innovation is of critical importance to American companies as they face increasing worldwide competition. Knowledge in the area is advancing rapidly and incorporates work from several disciplines, including strategy, marketing, organizational behavior, and finance. This course will be run as a research seminar. Students will be responsible for identifying relevant topics in the management of innovation and completing a research study. Students can work either individually or in small groups on the research topic they define. Students will be required to submit a research proposal, a progress report at mid-quarter, and a final paper and presentation.

45.289 Public Policy in Private Enterprise: An Evaluation of Government 4 Q.H.
 (Prereq. Honors participant or permission of instructor)

The course will address the major forms of regulation from classic industry—specific regulation and anti-trust to socially motivated regulation such as equal employment opportunity and environmental protection. The goal of the course is to increase students' understanding of the regulatory arena and to analyze the regulatory function. The course will culminate in an individual term research project and an oral presentation.

45.290 Honors Course—The Japanese Company: A Study in Comparative Management 4 Q.H.
 (Prereq. Honors participant or permission of instructor)

This course will compare the Japanese company with the American company. Study includes the historical and political-social-economic contexts in which the Japanese company operates. A research project requiring library and field research is required. The course probes the management practices of U.S.-based companies owned and operated by Japanese corporations, the results of American firms that have tried to adopt a Japanese model for U.S. operations, and the reality and myth of "Japan, Inc."

45.292 Honors Course—Designing Innovative Organizations 4 Q.H.
 (Prereq. Honors participant or permission of instructor)

This course focuses on how high-technology firms must be designed and managed to perform effectively and to develop and bring new

products to market. Students will be involved in: 1) the study of literature pertaining to these issues; 2) the collection of data on the above issues by interviewing members of high-technology firms and administering questionnaires; 3) analysis of the data in an attempt to discover how effective firms function; and 4) writing of a report based on their study. Students will thus be exposed to the techniques and requirements of research, have an opportunity to deal with executives and managers in high-technology firms, and be asked to critically evaluate new, as well as existing, literature on the subject of organization design and theory.

45.295 Small Business Institute Project 8 Q.H.
(Prereq. Junior standing; one entrepreneurship course or permission of instructor)

The Small Business Institute Field Project was brought into existence with the cooperation of the Small Business Administration (SBA) and

some of its client companies in greater Boston. A student team is expected to interact with a smaller company, helping management to analyze opportunities and problems facing the business, and to develop practical recommendations for the company's decision makers. Students are expected to allocate approximately one day per week to the project, including on-site work with the company owner-managers with whom they have been paired and to participate in related research, report preparation, and presentation of results. This real-world experience is blended with occasional class meetings and frequent team meetings with a faculty member to discuss the field work and to explore alternatives. Interim progress reports and a final report are presented to the client company, SBA, and the class.

Also see course 30.205, Writing for the Professions: Business Administration.

International Business Administration

46.100 Introduction to International Business 4 Q.H.
(Prereq. Middler standing)

This course focuses on the cultural, economic, and political aspects of domestic and foreign environments and their effect on the international operations of business firms. Topics covered include 1) the principles, patterns, and potential of international trade and investments; 2) the development of management strategies for international businesses; and 3) the organization and management of the firm's international operations.

46.101 Seminar in International Business 4 Q.H.
(Prereq. 46.100)

This course applies the concepts and skills acquired in other international and domestic courses to the solution of managerial problems. It focuses on the task of solving significant managerial problems in international and foreign cultural contexts. Students' reports form a major part of this course and are expected to concentrate either on a functional business area related to international operations or on analyses of market opportunities and methods of entry in a foreign environment. Other instructional

vehicles include case analyses and discussions of current issues.

46.102 Comparative International Management 4 Q.H.
(Prereq. Middler standing)

The objective of this course is to help to develop the student's conceptual and analytical abilities to: 1) identify and analyze management systems in various national settings and 2) understand the impact of economic, social, political, and cultural variables on management systems.

46.103 Environmental Pressures and the Multinational Corporation 4 Q.H.
(Prereq. 45.209 and 45.210)

Rapid multidimensional change in the world environment creates substantial pressures on corporations—especially large multinationals. The purposes of this course are to identify and evaluate: 1) environmental pressures most likely to have impact in the coming decade(s); 2) planning approaches that may be useful to the manager in analyzing the changing world environment; and 3) possible corporate responses to any environmental pressures. This course is designed both for students in international business and for those who have a general interest in the changing environment.

Transportation

48.101 Principles of Transportation 4 Q.H.
(Prereq. 39.105 and middler standing)

Topics include the political, social, and economic functions of transportation; development and structure of the domestic transportation system; the nature of government regulation and promotion of the several modes.

48.102 Current Issues in Transportation Policy 4 Q.H.
(Prereq. 48.101)

This course provides an overview of the regulatory process and its impact on the domestic transportation system; critical examination of topical policy issues that con-

front carriers, shippers, and the agencies of regulation.

48.103 Carrier Management 4 Q.H.
(Prereq. 48.101)

This course examines the transportation system from the carrier's viewpoint; managerial response to a heavily regulated and rapidly expanding environment; focus on carrier decision making involving routes, scheduling, financing, and pricing of services.

48.104 Physical Distribution Management 4 Q.H.
(Prereq. Middler standing)

This course is concerned with movement, distribution, and control of raw material and finished goods flows. Examination of the importance of inventory control, scheduling, warehousing, and transportation in the design and operation of distribution systems care.

48.105 Urban Transportation 4 Q.H.

This course focuses on the movement of people and freight in and around metropolitan areas. Study includes a management approach to the planning, implementation, and operation of mass transit systems. Interrelations of transit with other urban programs, the auto mode, and the government/public sector will be discussed.

48.106 Air Transportation 4 Q.H.
(Prereq. 48.101)

The course offers a managerial perspective on economics and regulation of aviation. The course probes aspects of commercial aviation,

passenger and cargo transportation, and key areas of general aviation.

48.108 Transportation Labor 4 Q.H.
(Prereq. 48.101)

This course focuses on the significance of the labor component in the transportation industries. Attention is devoted to trends in employee compensation, productivity, and bargaining patterns. Also examined are the role of government in this area and the impact of transportation labor on shippers, carriers, and consumers.

48.110 International Transportation and Distribution Management 4 Q.H.

This course examines the present and future status of United States and world ocean and air transportation in international trade and development. The economic, regulatory, financial, and operating characteristics of these forms of carriage are examined with primary emphasis given to their impact on international trade patterns. Other topics include government promotion, subsidy, and technological innovation.

48.120 Seminar in Transportation and Distribution 4 Q.H.
(Prereq. 48.120 and 48.104)

This is a discussion- and research-oriented course that focuses on a limited number of advanced transportation and distribution topics. Included is interaction with business and government through individual research on the topic chosen for presentation by the student.

Also see course 49.262 for Independent Study.

General Business

49.100 Introduction to Business 4 Q.H.

This course focuses on the business organization as a system of interrelated functions and operations, the interactions between the organization and its environment, and the role of management in business organizations.

49.107 Management of Smaller Enterprises 4 Q.H.

This is a general management course that focuses upon the strategies and operating problems of smaller, already established business enterprises. The course is designed for individuals who are considering entrepreneurial careers or careers in management, finance, or marketing within the smaller-company environment. Discussion will explore the characteristics and urgencies of problems that smaller companies are likely to encounter at different stages in their evolving life cycle, from the postnatal period to the more mature stage.

49.124 Honors: Seminar in Research 4 Q.H.
(Prereq. 49.251)

This seminar focuses on the definition of research in the context of the business environment, research methodologies, and the

student's attempt at research through a term project. Methodological issues include the formulation of concepts, hypotheses, and theories; the design of research projects; data collection; data analysis; and report writing. The term project involves investigation of a subject of interest to the student. The projects are intended to serve as prototypes of honors theses.

49.155 Legal Aspects of Business 4 Q.H.

This course examines the legal aspects of business transactions and business relationships involving contracts; sales, bulk transfers, and secured transactions under the Uniform Commercial Code; principal and agency; and suretyship and guaranty.

49.157 Management Information Systems 4 Q.H.
(Prereq. 49.205 and junior standing)

This course will examine the design, implementation, and operation of management information systems (MIS), and those characteristics of MIS that have the greatest impact on the effectiveness and efficiency of business organizations. Emphasis will be placed on computer-based systems that support managerial decision making, planning, and control. The

course will include a computer project using a data base management system.

49.205 Introduction to Data Processing 4 Q.H.

This course is designed to introduce the business student to those aspects of modern data processing techniques vital to his/her future job performance. During the first part of the course, the student will have the opportunity to learn to program in the BASIC language on the University's VAX 11/780 time-sharing system. The second part of the course deals with the history of data processing, computer hardware and software, and an overview of the creation and operation of management information systems.

49.210 The Law of Business Organizations and Commercial Paper 4 Q.H.

(Prereq. 49.155)

This course is an introduction to the legal aspects of the typical forms of business organizations, partnerships, corporations, and the rights, responsibilities, and liabilities involved. The course also covers the law governing commercial paper under the Uniform Commercial Code and the Bankruptcy Reform Act of 1978.

49.212 Law of Wills, Trusts, and Estates 4 Q.H.

Topics include requirements of valid will, claims of and against estates; the administration of estates, both formal and informal; essential elements for the creation of a trust; kinds of trusts, including inter vivos and testamentary trusts; the rights, responsibilities, and liabilities of trustees; and the rights of beneficiaries.

49.214 Decision Analysis 4 Q.H.

(Prereq. 49.251)

This course focuses on the analysis of decision making with particular emphasis on realistic problems under uncertainty. The course aims to help improve the student's ability to make better decisions through a careful consideration of alternative courses of action and their consequences, relevant objectives, and the element of risk. Topics include the basic components of decision problems, the concepts of risk and utility, decision trees, and value of information and multicriteria decision making.

49.215 Bulk Sales and Bankruptcy 4 Q.H.

(Prereq. Middler standing)

In examining bulk transfers, a detailed study is made of the Uniform Commercial Code, Article 6: the need of the transferor to give to the transferee a sworn list of all his creditors; the contents of the notice; what creditors are protected; and the legal consequences of failure to comply with the Code. The bankruptcy aspect of this course deals with both voluntary and involuntary bankrupts, the acts of bankruptcy, the appointment and duties of the trustee, provable and dischargeable debts, priority of debts, discharge and acts that bar a discharge.

49.240 Law in Society 4 Q.H.

(Prereq. Middler standing)

The course is designed to provide students the opportunity to acquire a broad view of their legal rights, obligations, and responsibilities in their relations with others and with the state. Includes study of torts such as assault and battery, trespass, negligence, slander, libel, and deceit; and crimes such as homicide, assault and battery, robbery, arson, larceny, and burglary.

49.249 Introduction: Quantitative Methods in Business 4 Q.H.

(Prereq. 10.119)

A model is a simplified representation or abstraction of reality. The focus of this course is on the representation of systems or managerial problems in the form of mathematical models and their application to problem solving in business. Criteria for selecting an appropriate model description are discussed and specific techniques for development examined, including linear programming, differential calculus, and the use of descriptive statistics.

49.250 Business Statistics I 4 Q.H.

(Prereq. 49.249)

Statistics is a methodology concerned with data collection, analysis, and interpretation. Information generated by statistical methods is used for analyzing decisions in the face of uncertainty. This course introduces fundamental concepts and methodology of probability, probability distribution, Bayesian revisions, estimation, and hypothesis testing.

49.251 Business Statistics II 4 Q.H.

(Prereq. 49.250)

Continuation of 49.250. Topics include chi-square tests, simple and multiple regression-correlation analysis, and elementary concepts of decision theory.

49.262 Independent Study 4 Q.H.

For a student who has received approval of a proposal to undertake independent study in lieu of any course required in the various concentrations. Each teaching area considers proposals presented by students to its Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study will take place. A copy of the final report prepared by the student will be presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from area coordinators.

- 49.263 Independent Study

4 Q.H.

Same as 49.262.
- 49.264 Independent Study

4 Q.H.

Same as 49.262.
- 49.265 Independent Study

4 Q.H.

Same as 49.262.
- 49.266 Independent Study (Honors)

4 Q.H.

Directed study toward fulfillment of Honors Program requirements. Open only to students who have been accepted into the Honors Program. Procedures for arranging the Honors Independent Study are the same as those for 49.262.

Foundations of Education

- 50.114 Education and Social Science

4 Q.H.

An interdisciplinary course that draws on anthropology, psychology, and sociology and exposes students to some of the concepts, methods, and terminology of these fields. Main themes are the evolution of human nature, the influence of previous experience and learning on the behavior of individuals and groups, difficulties in achieving a full degree of humanity in a technological society, and the potentially powerful roles that "professional socializers" (teachers, clinicians, group leaders, etc.) can play in the lives of students and clients. Required for freshmen in the Boston-Bouvé College of Human Development Professions (except Physical Therapy); open to other students as an elective; prerequisite for subsequent courses in Social Foundations (50.161-50.168).
- 50.121 Human Development and Learning I

4 Q.H.

Developmental processes from prenatal life up to adolescence. Theories of learning and personality with research and case material covering major aspects of psychological development.
- 50.131 Human Development and Learning II

4 Q.H.

Basic overview of the continuity of human development in contemporary society, from the pre-adolescent period through adolescence, adulthood, middle age, and old age. Significant areas of growth, development, and adjustment for each period are considered, including social, sexual, personality, motivational, and cognitive aspects. 50.121 is *not* prerequisite for this course.
- 50.132 Creative Expression in Children

4 Q.H.

(Prereq. 50.121)
Designed to assist students who are interested in working with children in a variety of settings. Discussion focuses on the potentials of creative expression in interpersonal communication; the relation of children's creative experiences

- 49.291 Decision Analysis with Multiple Objectives

4 Q.H.

(Prereq. Honors participant or permission of instructor)
This course examines normatively oriented approaches to decision making with multiple conflicting objectives. Topics include the identification of decision criteria, courses of action and their consequences, assessment of risk and uncertainty, multiattribute preference models and utility assessment through tradeoff analysis, nondominated decision alternatives, "satisficing," and other approaches. Discussions will include assigned case problems and a term project to be completed by each student.

- to their cognitive, emotional, and social development; and related topics that will provide students the opportunity to acquire experience and confidence in working with various media available for creative expression.
- 50.133 Educational Applications of Social Psychology

4 Q.H.

(Prereq. 50.121 or 50.131)
Focus is on theory and research in social psychology especially relevant to education. Areas covered are prejudice in the classroom; the school as a setting for manifestation of authoritarian personality; attitude organization and change in an educational environment; the class and the clique as "small groups"; the expression of need for achievement in various school structures; related topics.
- 50.134 Mental Health in Teaching

4 Q.H.

(Prereq. 50.121 or 50.131)
Factors involved in the choice of teaching as a career and psychological and occupational factors that contribute to teacher happiness, dissatisfaction, adjustment, and maladjustment. Examination of these factors is a background against which to consider: 1) what teachers can do to foster healthy personalities; 2) how to deal with psychological forces in the classroom; and 3) steps to strengthen the emotional development of the normal child.
- 50.135 Cross-Cultural Studies of Child Rearing and Education

4 Q.H.

(Prereq. 50.121 or 50.131)
Child rearing and child life in contrasting cultures around the world. Emphasis is on cognitive, emotional, and behavioral outcomes of concern to American educators, human services workers, and parents. Consideration is given to alternative patterns of child rearing possibly useful in modern society. Readings focus primarily on ethnographic descriptions of particular cultures and psychological comparisons of children from contrasting backgrounds.

50.136 Language and Cognition: Educational Implications 4 Q.H.

(Prereq. 50.121 or 50.131)

Development of language and thought in the child: concept learning, problem solving, and language acquisition. Particular consideration given to the implications of current research and theory in these areas for educational practice.

50.137 Seminar In Adolescent Psychology 4 Q.H.

(Prereq. 50.131)

In-depth examination of motivational, intellectual, social, and emotional development of adolescents, from end of pre-adolescence to beginning of young adulthood. Special attention is given to current issues such as drug use, sexual behavior, and vocational choice. Each student is expected to examine a topic of choice in some depth.

50.138 Seminar In Human Learning and Motivation 4 Q.H.

(Prereq. 50.121 or 50.131)

Survey and analysis of the literature on human learning and motivation. Emphasis on interaction between human learning and motivation in the developmental process and the classroom.

50.139 Seminar In Early Childhood**Development 4 Q.H.**

(Prereq. 50.121)

The theory and research regarding the cognitive, personality, and social development of children from birth to six years, with respect to the implications for early childhood education. Various existing programs examined and new directions explored.

50.141 Measurement and Evaluation 4 Q.H.

(Prereq. 51.135)

The fundamentals of measurement: the use of basic statistical concepts and techniques; evaluation of standardized and teacher-made tests.

50.142 Introduction to Educational Statistics 4 Q.H.

Emphasizes descriptive statistics useful in the evaluation of educational and related professional activities. Topics ordinarily covered include statistical notation, variability, probability, sampling techniques, linear regression, correlation, t-tests, and chi-square tests of significance. Examples of applications of these techniques will be drawn, so far as possible, from the fields for which students in the course are preparing and may vary from quarter to quarter.

50.152 Comparative Education 4 Q.H.

A comparison of the national school systems of selected foreign countries with the school system in the United States. Course content includes comparative data in the fields of teaching, speech and hearing, special education, and human services.

50.153 Philosophy of Education 4 Q.H.

Objective is to help participants examine their own purposes in relation to those of the school as an institution. Course reading material will consist primarily of philosophical writings on topics such as the ethics of educational intervention, the delineation of educational concepts, the educational messages of long-range speculations and utopias, and normative assumptions underlying educational policies.

50.154 Current Issues In American Education 4 Q.H.

An analysis of the variety of current issues confronting teachers, speech and hearing clinicians, special education practitioners, and human services specialists. Attempts will be made to place these issues in a historical context.

50.161 Seminar In Group Process 4 Q.H.

A study of the structure, dynamics, and function of face-to-face groups to learn about goal achievement and task orientation. The course operates mainly by committee or group instrumentation. The serious student should work to gain an understanding of the function of informal relationships within formal organizations, the various roles within groups, peer relationships, superior-subordinate relationships, authority and intimacy, and the inclusion and exclusion processes.

50.162 Day Care and Nursery Schools: Social and Cultural Origins 4 Q.H.

An exploration of the origins of the increased contemporary use of out-of-the-family child care arrangements in the United States and in selected European and Third World nations. Course topics include the interrelations of industrialization, technology, and family functioning; contrasting varieties of child care centers in operation today; and effects of the proliferation of child care centers on other aspects of society, such as neighborhood life, business, parents' lifestyles, elementary school curricula, government spending, and the job market in education and human services. Two to four hours per week of fieldwork in a child care center are required of each student.

50.163 Schools as Social Systems 4 Q.H.

(Prereq. 50.114 or equiv.)

Analysis of schools as sociocultural subsystems within the larger society. Functional interrelation between student and school subcultures, status and role systems, authority structures in American schools. During most quarters, one section of this course focuses on elementary and secondary schools and a second focuses on day care centers and nursery schools; students preregistering should choose the appropriate section.

50.164 Class and Ethnic Relations in Education**4 Q.H.**

(Prereq. 50.114 or equiv.)

The various ways in which the American class system and patterns of ethnic group relations have affected, and have been affected by, American education. The limitations and potential of educational institutions with respect to the resolution of intergroup conflicts and the establishment of equal educational opportunities.

50.165 Organization and Politics of School Systems**4 Q.H.**

(Prereq. 50.114 or equiv.)

The political sociology of school systems in the United States. An analysis of the power and authority structures in contemporary education. Who decides what and how? Who controls the system? How are the various interest groups organized? What are the mechanisms for conflict resolution? The relation between professional and nonprofessional interest groups.

50.166 The Human Services Professions**4 Q.H.**

(Prereq. 50.114, 21.100, or equiv.)

Explores what a human service agency is, how it comes into being, how it grows and changes. Attitudes, values, skills, and knowledge of the human services worker are analyzed, as are reasons why people in modern society require human services assistance. Human services are viewed from the eyes of clients as well as society as a whole. Fieldwork in a human service agency is a major course component, as is a good deal of independent study. Required for all

human services majors; open to other students on space-available basis.

50.167 Education and Psychosocial Development**4 Q.H.**

(Prereq. 50.114 or equiv.)

(Prereq. 19.135 for human services majors)

Theories and research on the socialization functions of education. Topics covered include the relative influence of early vs. post-childhood socialization; the role of diverse educational experiences and institutions in personality development and change. Human services majors should arrange to take specially designated sections of this course, offered most quarters, after completing 19.135, Personality I.

50.168 Education and Social Change**4 Q.H.**

(Prereq. 50.114 or equiv.)

A sociological exploration of educational systems as independent and dependent variables in social change. Instances of planned educational change in various countries and their implications for contemporary American society.

50.190 Directed Study**4 Q.H.**

(Prereq. Permission of instructor)

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the Department. *Preparation:* Approval of the supervising faculty member and the Dean's Office of the Boston-Bouvé College of Human Development Professions. Approval forms must be submitted to the Dean's Office during the quarter prior to registration for the Directed Study.

Curriculum and Instruction

51.123 Fundamentals of Reading I**4 Q.H.**

This is the introductory course in development reading for prospective elementary teachers. In the first term, emphasis is on language and symbolic process as it relates to beginning reading. Areas of skill development, such as word recognition and meaning comprehension, are studied in detail, as are some methods and techniques of testing and grouping. Also included are an introduction to some reading books and materials, methods of teaching, and the psychology of learning to read.

51.124 Modern Mathematics Curricula**4 Q.H.**

Mathematics curricula in elementary and secondary schools, including experimental programs, presented in their historical setting.

51.125 Introduction to Reading**4 Q.H.**

This introductory course for non-education majors provides an overview of the most common current approaches to teaching reading and writing, and to diagnosis and planning. Case

studies, video-taped lessons, and direct observations in the Reading Clinic are analyzed and interpreted. The relations between speech and hearing development and dysfunction and reading and writing are investigated.

51.126 Teaching Reading in Secondary**Schools****4 Q.H.**

For English and social studies majors in the Boston-Bouvé College of Human Development Professions who are preparing for teaching at the junior or senior high school level. Basically, the same approach and organization applies to this course as to the elementary-level course. (One quarter)

51.127 Teaching Music in Elementary**Schools****4 Q.H.**

(Prereq. 51.135)

An examination of the traditional Orff, Kodaly, Dalcroze, and other approaches to elementary school music. Attention given to children's motivations and participation in singing,

listening, rhythmic, instrumental, and creative musical activities.

51.128 Teaching Music in Secondary Schools I **4 Q.H.**

(Prereq. 51.135)

A study of divergent views and approaches to teaching music to early adolescents. Problems related to curricular and extracurricular activities, including vocal and instrumental groups, will be examined, with particular attention to the problems of the changing voice. Music will be studied in its relation to other aspects of the curriculum. Opportunity will be provided to apply group and individual teaching skills.

51.129 Teaching Music in Secondary Schools II **4 Q.H.**

(Prereq. 51.135 and 51.128)

An examination of a number of concepts, approaches, and curriculum patterns employed in teaching high school music. Attention is given to music appreciation and music theory and to vocal, instrumental, ensemble, club, and concert areas of performance. Demonstration skills required to teach in high school programs will be explored.

51.134 Fundamentals of Reading II **4 Q.H.**

(Prereq. 51.123)

A continuation and extension of the first term. Study skills; speed and fluency development areas. The tutorial work is extended and the student is given further opportunity to achieve familiarity with books, materials, and methods.

51.135 Analysis of Teaching and Educational Process **4 Q.H.**

(Prereq. 50.131)

The relations that exist between instructional objectives and teaching behavior; applications of theories of human development and learning as they relate to subsequent specialized teaching methods and materials. Research results and promising theory are used to help extend the prospective teacher's concepts of the teaching function.

51.137 Remedial Reading **4 Q.H.**

(Prereq. 51.134)

For prospective teachers in the primary unit. This introductory course may assist in familiarizing the student with some of the most commonly known reading problems in the typical classroom as well as in the reading clinic; analysis and evaluation of the typical diagnoses of such problems; corrective programs. Tutorial work with a retarded reader, with each student keeping a log or journal of work with a particular reading problem.

51.138 Linguistics and Reading **4 Q.H.**

(Prereq. 51.134)

For prospective elementary-level teachers (primary unit). The major objective is to translate

the knowledge gathered from structural and descriptive linguistics into useful classroom instruction, which includes not only reading instruction, but basic instruction in the related language skills. The contributions, particularly of such writers as Fries, Barnhart, Bloomfield, and LeFevre, are experimented with and analyzed.

51.139 Writing and the Teaching of Writing **4 Q.H.**

(Prereq. 51.135)

A study of the logical and rhetorical bases of exposition and argumentative writing; relationships of assumptions, assertions, and implications; the nature of proof in the sciences, social sciences, and the humanities; strategies of argumentation; the effective consequences of word choice and sentence structure.

51.146 Reading/Study Skills I **4 Q.H.**

Designed to provide instruction in study and organizational skills to students who demonstrate a need in these areas. The skills of pre-viewing, locating main ideas and related details, outlining, summarizing, note taking, and vocabulary development will be explored and applied to the content of courses that students may be taking as part of their requirements.

51.148 Reading/Study Skills II **4 Q.H.**

(Prereq. 51.146 and permission of instructor)

This course is an extension of Reading/Study Skills I and will expand upon such previously examined topics as organizational skills necessary for effective handling of text materials, note taking, vocabulary development, and comprehension. New topics will include preparing for and writing examinations, writing and revising research papers, and an introduction to library skills. All skill work is expected to be applied to concurrent coursework.

51.150 Supervised Field Placement: Early Childhood **2 Q.H.**

(Prereq. Early Childhood sequence through 51.142)

A University-arranged institutional placement to allow students the opportunity to provide educational, remedial, and/or custodial services to children generally of ages two through five. Opportunity will be provided to analyze, develop, demonstrate, and evaluate skills and techniques in guiding the activities of children in nursery schools, day care centers, and/or kindergartens.

51.151 Student Teaching and Seminar **8 Q.H.**

(Prereq. Formal acceptance into and completion of advanced professional sequence with minimum 2.0 Q.P.A., both overall and in teaching major)

Full-time participation in a University-arranged and -supervised school program designed to provide opportunity for the analysis of learning and

teaching and for the demonstration, evaluation, and development of teaching skills.

51.152 Literature and Learning Materials for Children and Young Adults **4 Q.H.**

This course is designed specifically for prospective teachers. It offers a comprehensive survey and critical analyses of books and materials available for basic reading instruction and for supplementary reading activities. Recognition of recurring themes in children's literature, especially relating to the classics, is emphasized. The ultimate goal is to help expand the student's awareness of the range of materials available and their effective uses in a reading program. This course is suitable as preparation for courses in developmental or remedial reading.

51.153 Current Issues in Teaching the Gifted and Talented **4 Q.H.**

(Prereq. 50.121 or 50.131)

Students will have the opportunity to examine screening devices for identifying the gifted and talented and to evaluate their effectiveness. Different philosophical postures and grouping strategies will be analyzed in relation to individual needs and the needs of a democratic society. Advantages and disadvantages of homogeneous and heterogeneous grouping will be explored. Cognitive, perceptual, psychomotor, social, aesthetic, and ethical needs will be emphasized. Instructional approaches and materials for the gifted will be examined in relation to this broad spectrum of needs.

51.154 Fundamentals of Math and Science I **4 Q.H.**

This is the first of two sequential courses in methods and materials of mathematics and science teaching for elementary school teaching majors. The course offers a structured integrated approach to the subjects, stressing their principles and processes.

51.155 Fundamentals of Math and Science II **4 Q.H.**

This course is a continuation of 51.154.

51.156 Elementary Education Curriculum I **4 Q.H.**

The elementary school curriculum is analyzed on the basis of the overall objectives of the American elementary school. Students are expected to evaluate and organize units of work that are appropriate to the level at which they plan to teach. The integrated approach to learning is emphasized, with particular focus on science, social studies, and language arts.

51.157 Elementary Education Curriculum II **4 Q.H.**

(Prereq. 51.141)

The objectives, activities, and methods of evaluation in the elementary school are con-

tinued, with special attention to the areas of music, art, and physical education.

51.158 Education for the Future: A Humanistic Approach **4 Q.H.**

Through an examination of self-awareness, as well as human needs, values, and feelings, attention is focused on the students' methods of functioning in the teaching world of the future. As a creative and humanistic approach to the key problems, practices, and issues in education, this introductory course in the art and science of teaching is designed to serve as the basis for all other education-related courses in the program. There are no prerequisites for the course.

51.160 Pre-Practicum I **1 Q.H.**

Simultaneously or in a subsequent term, students enrolled in 51.135, Analysis of Teaching and Educational Process, are required to spend 20 hours in a field setting to analyze the extent to which the teaching models and/or the curricular information they have acquired in this course are being implemented in the schools where they have been placed. They will be expected to maintain appropriate journals of their activities and observations and to evaluate these in accordance with criteria developed in the course. The manner in which the students organize and interpret the data collected in the field and the extent to which they can apply theoretical constructs examined in the course to their field experiences will be critical factors examined by the instructor. Pass/fail only.

51.161 Pre-Practicum II **1 Q.H.**

Simultaneously or in a subsequent term, students enrolled in the course "Fundamentals of Math and Science I" are required to spend 20 hours in a field setting to analyze the extent to which the teaching models and/or the curricular information they have acquired in this course are being implemented in the schools where they have been placed. They will be expected to maintain appropriate journals of their activities and observations and to evaluate these in accordance with criteria developed in the course. The manner in which the students organize and interpret the data collected in the field and the extent to which they can apply theoretical constructs examined in the course to their field experiences will be critical factors examined by the instructor. Pass/fail only.

51.162 Pre-Practicum III **1 Q.H.**

Simultaneously or in a subsequent term, students enrolled in the course "Elementary Education Curriculum I" are required to spend 20 hours in a field setting to analyze the extent to which the teaching models and/or the curricular information they have acquired in this course are being implemented in the schools where they have been placed. They will be expected to maintain appropriate journals of their

activities and observations and to evaluate these in accordance with criteria developed in the course. The manner in which the students organize and interpret the data collected in the field and the extent to which they can apply theoretical constructs examined in the course to their field experiences will be critical factors examined by the instructor. Pass/fail only.

51.163 Methods and Materials for

Teaching Adolescents and Adults

4 Q.H.

Consideration of specific methods and materials appropriate to teaching adolescents and adults. The goals of this course are to develop in the students an understanding of the complexities of the materials and methodology of the teaching-learning process; to encourage within students attitudes conducive to and identified with good tenets of teaching; to foster in the students acceptance of the need to grow constantly and to be aware of the continuing development of our knowledge of the teaching-learning process.

51.164 Methods and Materials for

Teaching Adolescents and Adults II

4 Q.H.

This course provides for specific instructional subject areas. Topics include: Techniques of organizing and presenting lessons, developing teaching materials, using audio-visual equipment, developing and implementing evaluation

instruments, and selecting appropriate materials within each field of interest. 15 hours of field-work required.

51.165 Fundamentals of Curriculum

Development

4 Q.H.

An examination of how goals and objectives are selected and how priorities are determined. Methods for designing educational programs to meet specified goals, methods of evaluating educational outcomes in terms of the goals of the program, and techniques for modifying programs in the light of such performance are discussed.

51.190 Directed Study I

4 Q.H.

(Prereq. Permission of instructor)

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the Department. *Preparation:* Approval of the supervising faculty member and the Dean's Office of the Boston-Bouv  College of Human Development Professions. Approval forms must be submitted to the Dean's Office during the quarter prior to registration for the Directed Study.

51.191 Directed Study II

4 Q.H.

(Prereq. 51.190)

For students who have completed 51.190, Directed Study I. The preparation for this course is the same as that for the Directed Study I course.

Education—Counseling

53.114 Introduction to Counseling

4 Q.H.

(Prereq. Junior standing)

This course presents an exposure to major theoretical approaches to counseling. Students will receive training and practice in listening skills and are expected to develop facilitative responses. Classroom work will combine didactic presentations and experiential activities to assist students in understanding and implementing a variety of counseling approaches.

53.115 Introduction to Group Counseling

4 Q.H.

(Prereq. 53.114)

This course provides a foundational exposure to the theory and skills of group counseling as it is practiced in various human service settings. Topics cover developmental stages of counseling groups; approaches to leadership style and strategies for starting, maintaining, and terminating the counseling group. The course includes an opportunity for students to practice rudimentary skills of leadership of counseling groups and to become involved in focused group process activities.

53.112 Introduction to Family Systems Counseling

4 Q.H.

(Prereq. 53.114)

This course provides an introduction to the concepts and skills of family systems therapy, a

counseling orientation in which the family is the chosen social unit of assessment and intervention for the client's problem. The course covers major approaches within communications and structural frameworks, emphasizing implications for normal family development and interventions in dysfunctional systems, and addresses theory and strategies for working with marital and parenting subsystems. Course offers students a beginning opportunity to experience the manner in which their family affects their functioning in various social systems with which they have professional contact.

53.111 Case Management: Diagnosis and Treatment

4 Q.H.

(Prereq. 21.100 or 50.114; 50.121-50.131 or 19.105-19.106; 21.157; 50.166)

The course offers an introduction to the basic theory and skills of managing client's treatment programs in a variety of institutional settings. Students receive training to identify the components of a psychosocial assessment, examine commonly used techniques of planned service delivery and resource coordination, and review the diverse entitlements that are available to clients of diverse needs and backgrounds. Much of the instruction will occur in a seminar-like format.

Speech-Language Pathology and Audiology

55.122 Introduction to Speech and Hearing

4 Q.H.

Course offers an overview of disorders of speech and hearing and their treatment, and a review of normal speech and hearing development. Clinical observations of persons with speech, language, and hearing disorders are required.

55.123 Speech Science

4 Q.H.

(Prereq. 55.122 and 55.125)

Course offers an examination of the basic sciences involved in speech and audition, including in-depth study of the analysis of sound and the acoustic composition of speech. Emphasis is placed on a review of current theory and research in speech reception, perception, and production.

55.125 Hearing Science

4 Q.H.

(Prereq. 55.122)

Basic concepts related to the physics of sound are presented, followed by an in-depth study of the anatomy and physiology of the normal hearing mechanism. In addition, basic principles of psychophysics of audition are discussed.

55.126 Anatomy and Physiology of Vocal Mechanisms

4 Q.H.

(Prereq. 55.122)

Course offers an in-depth study of the static structure, musculature, and physiology of the speech mechanism. Current research in speech physiology is emphasized.

55.127 Introduction to Psychoacoustics

4 Q.H.

(Prereq. 55.123 or 55.125)

This course explores the physics of sound and the psychological aspects of hearing with an emphasis on clinical applications. Topics include threshold, loudness, pitch, adaptation, and auditory localization. The prerequisite may be waived only with permission of the instructor.

55.128 Psychoacoustics Laboratory

4 Q.H.

(Prereq. 55.127)

This course provides practical application of topics discussed in 55.127. Students are required to re-create some of the most interesting of the classical psychoacoustics experiments. The prerequisite may be waived only with permission of the instructor.

55.131 Developmental Semantics and Syntax

4 Q.H.

(Prereq. 55.122)

Course provides an analysis of the emerging semantic and syntactical aspects of language in normal and atypical children, with emphasis on discussion of current theory and research in language acquisition. Clinical observations of children with normal and atypical language patterns are required.

55.133 Phonetics and Developmental Phonology

4 Q.H.

(Prereq. 55.122 and 55.126)

Course offers a basic training in auditory recognition and symbolization of phonemes and allophones in major American dialects. Static and dynamic articulatory descriptions are stressed. Course also includes a review of the developmental sequence of phonemic acquisition.

55.141 Phonemic Disorders

4 Q.H.

(Prereq. 55.126, 55.131, and 55.133)

Course provides a practical and theoretical examination of the phonemic disorders and their etiology; diagnostic tools for evaluation and methods of treatment. Clinical observations of persons with phonemic disorders are required.

55.142 Introduction to Audiology

4 Q.H.

(Prereq. 55.125)

Course focuses on the basic techniques of audiometric testing and hearing conservation, including a review of basic hearing sciences and a pre-practicum and lab experience in hearing and testing.

55.143 Diagnostic Techniques

4 Q.H.

(Prereq. 55.131, 55.133, 55.141)

Course offers a presentation and review of diagnostic tests and procedures in speech pathology. Emphasis is on the parent interview; the oral examination; and the appraisal of phonemic, phonatory, language, fluency, and auditory disorders. Observations of diagnostic evaluations are required.

55.144 Orientation to Clinical Practices

4 Q.H.

(Prereq. Senior status)

This is a pre-practicum course designed to introduce students to the policies of ASHA; to offer exposure to related health professions; to discuss the influence of state and federal legislation upon the delivery of speech-language and hearing services; to examine the role of the clinical supervisor; and to practice writing clinical goals and lesson plans.

55.154 Fluency Disorders

4 Q.H.

(Prereq. 55.126)

Course offers a comprehensive study of the various theories of stuttering from the earliest historical references through the nineteenth and twentieth centuries. Clinical observations are required.

55.155 Clinical Practice and Seminar

4 Q.H.

(Prereq. 55.144)

Course provides full-time participation in a University-arranged and -supervised school program designed to provide the student with initial involvement in the clinician-client relationship and an opportunity to demonstrate, evaluate, and develop clinical skills.

55.159 Basic Manual Communication**Systems****4 Q.H.**

Course focuses on the use of manual communication systems in deaf education (Manual English, SEE, and Signed English). Discussions will cover the goals and assumptions underlying these systems, their relation to American Sign Language and English, and the application of these systems in educational and clinical systems. Instruction is provided in introductory level English Sign Language.

55.160 Directed Study**4 Q.H.**

(Prereq. Permission of instructor)

This course is provided for the student whose unique academic needs or interests cannot adequately be satisfied in any of the scheduled courses of the Department. *Preparation:* Approval of the supervising faculty member and the Dean's Office of the Boston-Bouv  College of Human Development Professions. Approval forms must be submitted to the Dean's Office during the quarter prior to registration for the Directed Study.

Special Education and Rehabilitation

56.120 Introduction to Special Education**4 Q.H.**

A survey of the characteristics and the social, emotional, and educational adjustment of special-needs individuals. The effects of society's attitudes, the individual's own attitude toward the handicap, and the effect of the handicap itself are evaluated. Current legislation will be reviewed.

56.121 Introduction to Learning Disabilities

(Prereq. 56.120)

4 Q.H.

This course surveys behavioral characteristics of children who present specific deficits in perceptual, integrative, or expressive processes that impair learning efficiency. Students are expected to work to develop competencies in diagnosing curriculum materials and teaching methods.

56.124 Diagnostics in Special Education**4 Q.H.**

(Prereq. 56.120 and 56.121)

Students should work to develop competence in 1) observing, recording, and analyzing children's behavior and learning environments, including continuous measurement and informal assessment of general, specific, and behavioral learning needs; and 2) techniques of formal assessment of general, specific, and behavioral learning needs.

56.126 Methods and Materials of Teaching in Special Education**4 Q.H.**

(Prereq. 56.120, 56.121, 56.124, or senior status)

Course instruction will focus on the following areas: 1) development and implementation of individualized educational plans, including task analysis, adaptation and selection of materials, strategies in applied classroom management techniques; and 2) adaptation and selection of materials and strategies in language arts, mathematics, and perceptual-motor skills.

56.130 Introduction to Emotional Disturbances in Children**4 Q.H.**

(Prereq. 56.120 or permission of instructor)

Review of emotional processes that interfere with learning behavior and a study of approaches used to deal with behavioral disorders. Emphasis is on classroom management tech-

niques, use of consultation, and parent-teacher interaction.

56.135 Socio-Pscho Dynamics of Family Life**4 Q.H.**

An introduction to and survey of the internal and external dynamics of family life. The significance of such dynamics to the mental health of the special-needs child will be examined. The approaches to working with parents and the school-home relationships, as well as the effects of disability on the family, are explored.

56.140 Psychology of the Mentally Retarded**4 Q.H.**

Analysis of the etiology, nature, and needs of the retarded individual, emphasizing cognitive and psychosocial development. Implications of these characteristics for life-span management are explored in conjunction with parental and community attitudes and involvement.

56.150 Introduction to Rehabilitation**4 Q.H.**

Overview of and orientation to the field of rehabilitation, including its historical development, psychological implications, and sociological dimensions. Special attention is paid to rehabilitation of specific disability groups such as the physically disabled, emotionally disturbed, mentally retarded, alcoholic, drug dependent, and public offender.

56.190 Directed Study**4 Q.H.**

(Prereq. Permission of instructor)

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the Department. *Preparation:* Approval of the supervising faculty member and of the Dean's Office of the Boston-Bouv  College of Human Development Professions. Approval forms must be submitted to the Dean's Office during the quarter prior to registration for the Directed Study.

93.230 Field Experience in Human Services I**4 Q.H.**

Human Services students are required to fulfill two fieldwork placements during the last two

years of their program. Each placement consists of 150 hours on site. The type of placement varies according to the student's interest. Field experiences are supervised by University staff to maximize the student's learning opportunity.

Physical Education

- 62.10A Beginning Swimming

1 Q.H.
- Instruction in basic swimming skills, with emphasis on personal water safety.
- 62.10B Intermediate Swimming

1 Q.H.
- (Prereq. 62.10A or equiv.)
Instruction in basic and advanced swimming skills, with emphasis on form and efficiency.
- 62.10G Water Polo

1 Q.H.
- (Prereq. 62.10B or equiv.)
Instruction in beginning water polo, with emphasis on personal skill, offensive and defensive team play.
- 62.10H Advanced Life Saving

2 Q.H.
- (Prereq. 62.10B or equiv.)
Instruction in Red Cross life-saving skills, techniques, and theory. Red Cross certification is possible.
- 62.10L Water Safety Instructor

2 Q.H.
- (Prereq. 62.10B, 62.10K)
Instruction in techniques, theory, and teaching methods in swimming and life-saving courses. Red Cross certification is possible.
- 62.10M Beginning Scuba

2 Q.H.
- (Prereq. 62.10B or equiv.)
Instruction in basic skin-diving and scuba-diving skills, with emphasis on personal safety.
- 62.10R Small Crafts

1 Q.H.*
- Introduction to basic skills in sailing.
- 62.12A Folk and Square Dance I

1 Q.H.
- Introduction to folk and square dance at the beginning and intermediate levels.
- 62.12E Modern Dance I

1 Q.H.
- Introduction to modern dance technique and style.
- 62.12F Modern Dance II

1 Q.H.
- (Prereq. 62.12E or equiv.)
A continuation of 62.12E with progression to more complex modern dance techniques and movement combinations. Practice in the use of improvisation for exploring dance movement.
- 62.12G Modern Dance III

1 Q.H.
- (Prereq. 62.12F or equiv.)
A continuation of 62.12F with progression into the expressive and choreographic use of modern dance techniques.
- 62.12H Ballet I

1 Q.H.
- Introduction to the fundamentals of classical ballet; its vocabulary, structure, and style.

- 93.231 Field Experience in Human Services II

4 Q.H.
- (Prereq. 93.230 and senior status, permission only)
- 62.12J Ballet II

1 Q.H.
- (Prereq. 62.12H or equiv.)
A continuation of 62.12H. Progression into the expressive and choreographic use of classical ballet techniques.
- 62.12K Ballet III

1 Q.H.
- (Prereq. 62.12S)
A continuation of 62.12J with an in-depth study of complicated variations derived from the classical ballet technique.
- 62.12L Jazz Dance I

1 Q.H.
- Introduction to jazz dance techniques and styles.
- 62.12M Jazz Dance II

1 Q.H.
- (Prereq. 62.12L or equiv.)
A continuation of 62.12L with progression to more complex jazz dance techniques and combinations.
- 62.12N Jazz Dance III

1 Q.H.
- (Prereq. 62.12M or equiv.)
A continuation of 62.12M and progression into the choreographic process of jazz dance.
- 62.12P Rhythmic Analysis

1 Q.H.
- (Prereq. Physical education major or permission of instructor)
Analysis of rhythm as it applies to movement skills and basic dance.
- 62.12Q Ballroom and Disco Dance

1 Q.H.
- An introduction to ballroom dance and contemporary disco dancing.
- 62.12R Ballroom Dance

1 Q.H.
- An introduction to traditional and contemporary ballroom dance.
- 62.12S Dance Improvisation/Composition

1 Q.H.
- (Prereq. 62.12E, H, or L)
Practice in the use of dance as a medium for artistic expression. Emphasis on the development of skill in the use of improvisational techniques. The student is expected to participate in creating and structuring short dance compositions.
- 62.13P Gymnastics Orientation

1 Q.H.
- Basic approach to tumbling, vaulting, and trampoline. Designed to assist the nongymnast.
- 62.13V Beginning Gymnastics I

1 Q.H.
- (Prereq. 62.13P or equiv.)
A coeducational approach to knowledge of and basic skills in floor exercise, vaulting, balance

* Lab fee required.

beam, parallel bars, uneven bars, high bar, and rings.

62.13W Women's Gymnastics II 1 Q.H.
(Prereq. 62.13V)

Focus is on knowledge and skill necessary in performing the beginning compulsory routines on the balance beam, floor exercise, uneven bars, and vaulting.

62.13X Women's Gymnastics III 1 Q.H.
(Prereq. 62.13W)

Skill and knowledge related to the performance of optional routines in the four areas of competitive women's gymnastics.

62.13Y Men's Gymnastics II 1 Q.H.
(Prereq. 62.13V)

Skill and knowledge related to the performance of beginning compulsory routines on the high bar, side horse, rings, floor exercise, parallel bars, and vaulting horse.

62.13Z Men's Gymnastics III 1 Q.H.
(Prereq. 62.13Y)

Skill and knowledge related to performance in optional routines on the high bar, side horse, rings, floor exercise, parallel bars, and vaulting horse.

62.14A Badminton 1 Q.H.
Instruction in basic badminton strokes, concepts, rules, strategies, and game play.

62.14C Tennis 1 Q.H.
Instruction in basic tennis strokes, concepts, rules, strategies, and game play.

62.14E Intermediate/Advanced Badminton 1 Q.H.
(Prereq. 62.14A)

Instruction in badminton, including intermediate and advanced skills, with emphasis on singles and doubles match play and strategy.

62.14G Intermediate/Advanced Tennis 1 Q.H.
(Prereq. 62.14C or equiv.)

Instruction in tennis, including intermediate and advanced skills, with emphasis on singles and doubles match play and strategy.

62.15A Movement Education 1 Q.H.
Concepts and techniques in movement education and exploration for elementary school educators.

62.15B Beginning Archery 1 Q.H.
Selected skills in target shooting and practical experience in archery games, novelty events, and conduct of tournaments.

62.15D Beginning Bowling 1 Q.H.*
Focus is on development of knowledge and skill necessary for competent performance in bowling at the beginning level. Practice provided in nearby commercial alleys.

62.15F Beginning Golf 1 Q.H.
Instruction in fundamental golf skills, knowledge of clubs and their use, and golf etiquette.

62.15H Beginning Self-Defense 1 Q.H.
A survey of the principles and fundamental skills. Instruction is geared to the beginning and intermediate levels.

62.15I Karate 1 Q.H.
Fundamental techniques of unarmed combat for self-defense using the punches, kicks, and blocks of Tae Kwan Do/Karate.

62.15J Beginning Boxing 1 Q.H.
Instruction in boxing at the beginning level; emphasis on offensive and defensive techniques, scoring, training, and officiating.

62.15K Beginning Wrestling 1 Q.H.
Beginning level of instruction in basic wrestling maneuvers. Stress on fundamental breakdowns, escapes, takedowns, rides, and pinning combinations. Rules and scoring procedures discussed and modified matches conducted.

62.15M Beginning Fencing 1 Q.H.
Instruction in basic foil fencing, including introduction to competition.

62.15N Intermediate/Advanced Foil Fencing 1 Q.H.
(Prereq. 62.15M or equiv.)
Instruction in intermediate/advanced techniques of foil fencing, with special emphasis on competition, judging, and the use of electrical equipment.

62.15Q Karate II 1 Q.H.
(Prereq. 62.15I)
Continuation of 62.15I, with progression to more complex techniques and combinations of punches, kicks, and blocks related to Tae Kwan Do/Karate.

62.15R Roller Skating 1 Q.H.
Instruction for beginners in recreational roller skating skills.

62.15S Beginning Ice Skating 1 Q.H.
Instruction for beginners in recreational ice skating skills.

62.15T Figure Skating 1 Q.H.
(Prereq. 62.15S or permission of instructor)
Instruction in beginning and intermediate figure skating skills.

62.15Y Yoga 1 Q.H.
Introduction to yoga skills and techniques for men and women at the beginning level.

62.16B Weight Training 1 Q.H.
Introduction to the principles and use of resistive exercises: isotonic exercise (weights), isometric exercise, and the appropriateness of each.

62.16C Physical Conditioning 1 Q.H.
Assessment of physical fitness and body composition. Instruction in training techniques. Special emphasis on personal exercise and dietary needs.

- 62.16I Beginning Cross-Country Skiing** 1 Q.H.
Instruction in the fundamental techniques of cross-country skiing.
- 62.16L Beginning Track and Field** 1 Q.H.
Instruction in the fundamental skills in the various track and field events.
- 62.16M Intermediate/Advanced Track and Field** (Prereq. 62.16L or equiv.) 1 Q.H.
Instruction in intermediate/advanced techniques in track and field events. Emphasis is placed on improvement of individual skills; techniques of officiating are discussed.
- 62.16P Beginning Handball** 1 Q.H.
Knowledge and skills appropriate to handball at the beginning level.
- 62.16R Beginning Racquetball** 1 Q.H.
Knowledge and skills appropriate for performance in racquetball at the beginning level.
- 62.16S Beginning Skiing** 1 Q.H.
The course offers instruction in fundamental techniques of downhill skiing.
- 62.16T Intermediate Skiing** 1 Q.H.
(Prereq. 62.16S)
The course provides instruction in downhill skiing, including intermediate and advanced techniques, with emphasis on skill development.
- 62.17C Basketball** 1 Q.H.
Knowledge and skills appropriate for performance in basketball at the beginning level.
- 62.17D Intermediate/Advanced Basketball** 1 Q.H.
(Prereq. 62.17C)
Knowledge and skills appropriate for performance in basketball at the intermediate to advanced levels.
- 62.17J Volleyball** 1 Q.H.
Knowledge and skills appropriate for playing volleyball at the beginning level.
- 62.17L Field Hockey** 1 Q.H.
Knowledge and skills appropriate for playing field hockey at the beginning level.
- 62.17P Football** 1 Q.H.
Fundamental skills and knowledge appropriate for beginning level performances in football.
- 62.18C Softball** 1 Q.H.
Knowledge and skill appropriate for performing in softball at the beginning level.
- 62.18E Baseball** 1 Q.H.
(Prereq. 62.18C or permission of instructor)
Knowledge and skill appropriate for baseball at the intermediate and advanced levels.
- 62.18G Women's Lacrosse** 1 Q.H.
Knowledge and skill appropriate for performance in lacrosse at the beginning level.
- 62.18J Men's Lacrosse** 1 Q.H.
Knowledge and skill appropriate for performance in lacrosse at the beginning level.

- 62.18M Soccer** 1 Q.H.
Knowledge and skill appropriate for performance in soccer at the beginning level.
- 62.19A Early Childhood Motor Skill Development** 2 Q.H.
A study of the development of fundamental motor patterns (run, catch, kick, strike, jump, throw) from ages 0 to 5 years, including perceptual-motor relations operating in vision, audition, and proprioception.
- 62.19B Games and Activities for Children** 2 Q.H.
Introduction to simple ball games, running and tag games, self-testing activities, movement exploration, and rhythms appropriate for children. Course content appropriate for future parents, teachers, and youth leaders.
- 62.200 Human Movement** 3 Q.H.
An introduction to the nature and role of human movement and the analysis of skillful movement performance through participation and observation. Introduction to the objectives, literature, and organization of the profession of physical education.
- 62.202 Life/Career Planning** 3 Q.H.
An examination and exploration of careers in physical education and related fields. The course provides an opportunity for students to assess personal skills and abilities, to research jobs of interest, and to practice specific career-planning skills.
- 62.204 Psychology of Sport** 2 Q.H.
(Prereq. P.E. or permission of instructor)
The psychological analysis of behavioral patterns and deviations of sports participants, including spectators and coaches. Emphasis on emotions, motivation, competition, and learning factors. Discussion of current sports highlights.
- 62.205 Group Dynamics I** 3 Q.H.*
(Prereq. 62.202)
An introduction to group dynamics through selected activities, discussion, and living and working together. A resident-living experience for one week at the Warren Center is an integral part of the course.
- 62.206 First Aid** 2 Q.H.
First-aid procedures recommended for the home, school, and community. Emphasis on practices endorsed by the American Red Cross.
- 62.208 Sociology of Sport and Dance** 2 Q.H.
(Prereq. Permission of instructor)
The study of sport and dance as social institutions, including theories explaining the role of each in contemporary society and the part of each in evolving societies.
- 62.209 History and Philosophy of Physical Education** 3 Q.H.
A survey of physical education from ancient times to the present. The influence of major

philosophical positions upon the nature of physical education programs is analyzed.

62.211 Comparative Physical Education 3 Q.H.
(Prereq. 62.210 or 50.152)

Analysis of systems of physical education and sport in selected countries and their interrelations with the larger cultural framework.

62.212 Theory of Coaching 2 Q.H.
(Prereq. Permission of instructor)

An analysis of learning principles, sociology, and psychology as applied to coaching individual, dual, and team sports. Techniques and standards of squad recruitment, organization, leadership, and coaching ethics are presented.

62.216 Elementary School Activities 3 Q.H.

Focus is on introductory knowledge and skills necessary for teaching physical education to elementary-school-aged children. Students are expected to learn analysis and application of children's performance and appropriate teaching techniques through observation and actual experience in off-campus schools and learning centers. Course is designed to satisfy partially the pre-practicum requirements for teacher certification at the K-9 level.**

62.217 Theory of Play 2 Q.H.

The nature of play and a study of cross-cultural patterns of play. An investigation of selected theories of play, including Huizinga, Caillois, Sutton-Smith, and Lee.

62.219 Secondary School Activities 3 Q.H.

Physical activity appropriate for secondary school youth is studied in relation to their level of development and interest. Students are expected to learn analysis and application of pupils' performance and appropriate teaching techniques through observation and actual experience in off-campus schools and learning centers. Course is designed to satisfy partially the pre-practicum requirements for teacher certification at the grades 5-12 level.**

62.220 Perceptual-Motor Development 4 Q.H.
(Prereq. 50.121 and 50.131; may be taken concurrently)

Course offers a study of the development of motor skills from birth through infancy, early childhood, adolescence, and adulthood, including skilled performance of the aged. Age expectations for perceptual-motor behavior are considered, with a focus on a functional adequacy in skilled performance.***

62.221 Perceptual-Motor Learning and Development 3 Q.H.

(Prereq. 50.121)

Interrelation of movement behavior and perceptual-motor organizations of vision, audition, and proprioception. A brief overview of major theories of learning as they apply to learning motor skills.

62.222 Perceptual-Motor Learning 4 Q.H.
(Prereq. 19.149, 19.156, 19.157)

A focus on the way information processing is involved in perceptual-motor learning and performance. Basic research data are applied to learning and executing skills in a variety of sports settings.

62.24B Swimming Analysis 2 Q.H.
(Prereq. 62.10B or permission of instructor)

Instruction in theory, analysis techniques, and teaching methods in swimming.

62.24E Analysis and Coaching of Men's Gymnastics 2 Q.H.
(Prereq. 62.13Z)

Skill analysis and coaching of men's gymnastics, with emphasis on appropriate teaching methods, new trends, and judging.

62.24F Analysis and Coaching of Women's Gymnastics 2 Q.H.
(Prereq. 62.13X)

Skill analysis and coaching of women's gymnastics, with emphasis on appropriate teaching methods and new trends.

62.24G Advanced Analysis and Judging of Women's Gymnastics. 2 Q.H.
(Prereq. 62.13W)

Advanced skill analysis techniques and instruction in judging women's gymnastics. May serve as preparation for judging certification.

62.24H Analysis and Coaching of Badminton 2 Q.H.
(Prereq. 62.14E)

Analysis of performance and methods of teaching and coaching in badminton.

62.24J Analysis and Coaching of Tennis 2 Q.H.
(Prereq. 62.14G)

Analysis of performance and methods of teaching in tennis.

62.24K Analysis and Coaching of Fencing 2 Q.H.
(Prereq. 62.15N)

Advanced skill analysis and coaching of fencing. Special emphasis on current research and teaching methods.

**Teacher certification requirements available in 106 Dockser Hall.

***Designed to satisfy partially pre-practicum requirements for teacher certification.

62.24L Analysis and Coaching of Golf 2 Q.H.*
(Prereq. 62.15F or equiv.)

Advanced skill analysis and coaching of golf. Special emphasis on course play and teaching methods.

62.24M Analysis and Coaching of Track/Field 2 Q.H.
(Prereq. 62.16M or equiv.)

Advanced skill analysis and coaching techniques for selected track and field events. Special emphasis is placed on the analysis of common movement patterns, teaching methods, and coaching techniques.

62.24N Analysis and Coaching of Wrestling 2 Q.H.
(Prereq. 62.15K or equiv.)

Analysis of performance and techniques of teaching selected wrestling skills are covered in detail. Application of research to methodology is stressed.

62.24P Analysis and Coaching of Baseball 2 Q.H.
(Prereq. 62.18E)

The basic techniques and responsibilities of coaching interscholastic and intercollegiate baseball, including advanced skill analysis, position and team play, conditioning, practice organization, and team management.

62.24Q Analysis and Coaching of Basketball 2 Q.H.
(Prereq. 62.17C)

The basic techniques and responsibilities of coaching interscholastic and intercollegiate basketball, including advanced skill analysis, position and team play, conditioning, practice organization, and team management.

62.24R Analysis and Coaching of Field Hockey 2 Q.H.
(Prereq. 62.17L)

The basic techniques and responsibilities of coaching intramural, interscholastic, and intercollegiate field hockey, including advanced skill analysis, position and team play, conditioning, practice organization, and team management.

62.24S Analysis and Coaching of Football 2 Q.H.
(Prereq. 62.17P)

The basic techniques and responsibilities of coaching interscholastic and intercollegiate football, including advanced skill analysis, team conditioning, offensive and defensive systems, practice organization, team management, and coaching staff organization.

62.24V Analysis and Coaching of Lacrosse 2 Q.H.
(Prereq. 62.18G or 62.18J)

The basic techniques and responsibilities of coaching intramural, interscholastic, and inter-

collegiate lacrosse, including advanced skill analysis, position and team play, conditioning, practice organization, and team management.

62.24W Analysis and Coaching of Soccer 2 Q.H.
(Prereq. 62.18M)

The basic techniques and responsibilities of coaching intramural, interscholastic, and intercollegiate soccer, including advanced skill analysis, position and team play, conditioning, practice organization, and team management.

62.24X Analysis and Coaching of Softball 2 Q.H.
(Prereq. 62.18C)

The basic techniques and responsibilities of coaching intramural, interscholastic, and intercollegiate softball, including advanced skill analysis and management.

62.24Y Analysis and Coaching of Volleyball (Men-Women) 2 Q.H.
(Prereq. 62.17J)

The basic techniques and responsibilities of coaching intramural, interscholastic, and intercollegiate volleyball, including advanced skill analysis, position and team play, conditioning, practice organization, and team management.

62.24Z Analysis and Coaching Special Problems 2 Q.H.
(Prereq. Permission Dept. chairperson)

Designed as directed study in a sport or activity not offered by the Department or in special scheduling situations.

62.248 Clinical Athletic Training 2 Q.H.
(Prereq. 62.256)

The student athletic trainer's introduction to clinical experience with an opportunity to practice the various skills for evaluation and treatment of the injured athlete.

62.250 Anatomy and Physiology I 4 Q.H.
Gross anatomy and physiology of the human skeletal, joint, nervous, and muscular systems.**62.251 Anatomy and Physiology II 4 Q.H.**
(Prereq. 62.250)

Gross anatomy and physiology of the human respiratory, endocrine, and circulatory systems; metabolism, calorimetry, and other topics will be covered.

62.253 Kinesiology I 4 Q.H.
(Prereq. 62.250 or equiv.)

Science of human motion and anatomic and mechanical principles as they relate to an understanding of skillful, efficient, and purposeful human motion. Introduction to the cinematographic analysis.

62.254 Exercise Physiology 4 Q.H.
(Prereq. 62.251)

Study of the immediate and long-range effects of exercise upon the human body, with emphasis

on the cardiovascular and respiratory systems, muscles, and metabolism; physical fitness, body composition, and selected components of motor performance—assessment techniques and training principles. Introduction to indirect, open-circuit calorimetry, and EKG monitoring.

62.255 Adapted Physical Education I 4 Q.H.
(Prereq. 62.222, 62.250, 62.253)

Survey of characteristics and attitudes pertaining to special-needs individuals, with particular emphasis on the effects of their presence on current physical activity programs. Observations of special-needs programs are included. ***

62.258 Athletic Training and Conditioning 3 Q.H.
The training and conditioning procedures in athletic programs; special emphasis on the prevention of athletic injuries; roles of the trainer, athlete, coach, and health service.

62.257 Advanced Athletic Training 4 Q.H.
(Prereq. 62.256)

The advanced preparation and utilization of conditioning programs and their administration for prevention and care of injuries associated with competitive athletics.

62.259 Laboratory in Exercise Testing and Prescription 4 Q.H.
(Prereq. 62.254)

Practicum in assessment of physical work capacity, cardiac function, muscular strength, muscular endurance, flexibility, and body composition; prescription of exercise programs used to improve the above functions; volunteer work as an exercise test technician and exercise leader in a fitness class.

62.260 Measurement and Evaluation 4 Q.H.
Construction, use, selection, and interpretation of evaluative tools applicable to physical education; elementary statistical methods.

62.263 Kinesiology II 4 Q.H.
(Prereq. 62.253)

A continuation of Kinesiology I, with emphasis on the mechanical aspects of human motion. The internal and external forces acting upon a human body and the effects produced will be examined.

62.265 Adapted Physical Education II 4 Q.H.
(Prereq. 62.255)

Assessment, diagnostic, and prescriptive procedures in special-needs physical education programs. Emphasis is on modification techniques and integration of programming in accordance with legislative guidelines. Practicum experiences in special-needs settings are included.

62.267 Principles of Physical Activity for the Older Adult 4 Q.H.

Principles of physical activity and the organization of physical activity programs for the elderly

*** Designed to satisfy partially pre-practicum requirements for teacher certification.

in public and private agencies are studied. Research and practical applications of theory are required.

62.270 Administration of Physical Education 4 Q.H.
(Prereq. 62.209 or 62.210)

The organization and administration of programs in physical education, with emphasis on elementary and secondary school programs.

62.271 Theory of Officiating 2 Q.H.
Knowledge and skills in the basic concepts of officiating individual and team sports.

62.272 Officiating Skills 1 Q.H.
(Prereq. 62.271 or permission of instructor)

Study of the knowledge and skills necessary for a beginning official in a sport selected by the student.

62.273 Sports Officiating 2 Q.H.
Theory, practice, and techniques of officiating in such sports as basketball, baseball, soccer, ice hockey, lacrosse, and football.

62.274 Sports Officiating 2 Q.H.
Theory, practice, and techniques of officiating in such sports as basketball, volleyball, softball, soccer, field hockey, lacrosse.

62.276 Critical Teaching Skills 4 Q.H.
(Prereq. 62.216 or 62.219)

Course offers analysis of direct and indirect, verbal and nonverbal teaching methods for classroom and activity teaching, using techniques such as microteaching, peer teaching, and simulation. Techniques for measuring teacher behavior, such as interaction analysis, are studied and analyzed. A laboratory experience in an education setting is an essential activity.***

62.278 Group Dynamics II 2 Q.H.
(Prereq. 62.205)

Exposure to outdoor activities, along with involvement in Project Adventure and other outdoor pursuits, to teach various skills.

62.280 Curriculum Development 3 Q.H.
(Prereq. 62.275 or permission of instructor)

Course focuses on basic foundations of curriculum development, stressing fundamental principles and guides to curriculum organization, format, and evaluation. Course material includes experience using the taxonomies of education objectives and survey of existing curricula and current curriculum trends.

62.281 Supervised Field Experience 12 Q.H.
(Prereq. Senior status in major or permission of instructor)

Course offers assignment in a field setting related to the student's area of concentration within the physical education curriculum, including observation and performance of professionally related skills under the guidance of a

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cooperating field professional and a college supervisor. To be taken by physical education majors who are not in a teacher certification program.

62.282 Supervised Student Teaching (Practicum) 12 Q.H.

Course provides a minimum of at least 300 clock hours in an approved school, with clear instructional responsibilities for at least half of the time and full teaching responsibilities for a substantial period of time under the guidance of a certified cooperating teacher and college supervisor. The assignment must be at the level of teacher certification sought (K-9 or 5-12) and include coaching and/or intramural organization and supervision, evaluation conferences, and seminars. Students can prepare themselves for Certificate No. 30 Teacher of Physical Education, as granted by the Commonwealth of Massachusetts.**

62.283 Modern Dance Composition 3 Q.H. (Prereq. 62.12F or permission of instructor)

An analysis of dance composition, with practice in choreography for solo, duet, and trio.

62.284 Dance History and Philosophy 4 Q.H.

A survey of dance from ancient times to the present. Consideration of dance as an art form in relation to other art forms and as an educational discipline.

62.286 Dance: Choreography and Production 4 Q.H.

Choreography for trio, quartet, and large groups based upon the projection of an idea or mood.

Theory and practice in the staging of student choreography, including lighting, costuming, scenery, and makeup.

62.287 Jazz Dance Composition 3 Q.H. (Prereq. 62.12M)

Theory and practice in the use of eurhythmics as applied to jazz movement. Progression to dance composition for jazz theatre and musical comedy.

62.289 Creative Dance I 2 Q.H. (Prereq. 62.12F or equiv.)

Theory and practice of methods and materials in teaching creative dance to elementary school children. Examination of the aims and responsibilities of dance education at the primary level.

62.290 Creative Dance II 2 Q.H. (Prereq. 62.12F or equiv.)

Theory and practice of methods and materials in teaching creative dance to secondary school children. Examination of the aims and responsibilities of dance education at the secondary level.

62.291, 62.292, 62.293 Special Programs 2, 3, or 4 Q.H.

(Prereq. Permission of Dept. chairperson)

The course focuses on independent investigation of physical education in an area of each student's interests. The investigation will be supervised by an appointed faculty member and will culminate in a formal written report.

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63.121 Guitar I 1 Q.H.

An introduction to using the guitar in recreation programs. Skill development includes basic chords, progressions, and strumming techniques.

63.12P Sports Leadership 2 Q.H.

The exploration of teaching techniques involved in team, dual, and individual sports. Methods, such as the part-whole and whole-part, are presented and investigated to establish relevance to each of the sports areas under study. Students are given the opportunity to develop skills in planning units and individual lessons. In addition, students are expected to apply practical experience by teaching one lesson in each of the sports areas studied.

63.12Q Survey of Aquatics 2 Q.H.

Exploration of various aquatic events that may enhance recreational swimming programs.

** Teacher certification requirements available in 106 Dockser Hall.

Students are given the opportunity to develop planning, execution, and evaluation techniques for each area of study. In addition, students may attend and evaluate a planned water event. Areas of study include party events for all ages, competitive swimming and diving, synchronized swimming, water polo, and events for the atypical.

63.12T Photography 1 Q.H.

A basic study including the history of photography, types of cameras, use of black-and-white and color film; use of F-stops and shutter speeds, darkroom equipment, supplies and procedures. Field trips exploring photography techniques and darkroom experiences are included.

63.12Y Introduction to Winter Skills 1 Q.H.

Course investigates several winter sports, their origins and history, current population demands,

and future trends. Various types of equipment and their use, as well as special health and safety considerations for winter sports, are discussed. Sports to be studied include cross-country skiing, snowshoeing, skating, tobogganing, and snowmobiling.

63.124 Camp Leadership 2 Q.H.

One-week resident camp experience at the Warren Center. Course subjects in the student-faculty-planned program include natural science, basic sailing and canoeing as well as campcraft skills, outdoor sports, and social recreation for special day and evening programs. Resident fee required.

63.128 Survey of Recreation Facilities 3 Q.H.

Study of fundamental management and administration concepts for a wide variety of outdoor areas and facilities such as parks, beaches, ice rinks, marinas, camps, and community centers.

63.129 School Camping 3 Q.H.

(Prereq. 63.171 or permission of instructor) Investigation of outdoor education as it applies to school camp organization, administration, program planning, and educational significance. Each student is required to participate in a one-week supervised practical experience at a designated school camp.

63.139 Life/Career Planning 4 Q.H.

This course is designed to help students develop life/career planning skills for use in pursuit of a career in recreation and leisure studies. A variety of careers, co-op job opportunities, and lifestyles of professionals in the field are explored. Students are given the opportunity to assess their own interests, values, needs, and skills and to develop job-finding skills, including resume writing and interviewing techniques.

63.140 Basic Sailing 2 Q.H.

Instruction leading to an opportunity to qualify for Red Cross basic sailing certification. Classes are held at the Warren Center and include theory and practical experience.

63.141 Basic Canoeing 2 Q.H.

Instruction leading to an opportunity to qualify for Red Cross basic canoeing certification. Classes are held at the Warren Center and include theory and practical experience.

63.144 Tripping and Orienteering 2 Q.H.

Practical experience in the art of orienteering, including its uses in camping, backpacking, and resident camping. Course is held at the Warren Center and includes overnight excursions. Fee charged.

63.145 Winter Sports 2 Q.H.

Five-day resident session. The course provides daily instruction in Alpine and cross-country

skiing. Includes predeparture seminars. Separate fees are charged for room, board, transportation, lifts, lessons, and equipment rental.

63.146 Camp Administration 3 Q.H.

The course offers investigation of camp management guidelines including site development, health and safety, hiring and staff training, public relations, American Camping Association standards, legal regulations, organization within camps, programs, and other selected administrative aspects.

63.147 Outdoor Education for the Handicapped 3 Q.H.

Program planning and methods of conducting programs relating to adaptation of facilities and activities necessary for the physically and mentally disabled are explored through observations, participation, and direct laboratory experience.

63.148 Introduction to Recreation and Leisure 3 Q.H.

The course provides an overview of the recreation and leisure service field with emphasis on history, scope, rationale, setting, programs and services, basic trends and issues, and future considerations. The course explores the basic elements of the recreation and leisure service field as they relate to society, the leisure profession, and the individual.

63.153 Social and Psychological Impacts of Illness and Disabilities 4 Q.H.

(Prereq. 63.162)

Exploration of relevant issues related to disability such as societal understanding of disability, handicapping conditions, adjustment, social networks, and the therapeutic use of self through a mixture of lectures, group discussion, guest speakers, and films. Examination of self in the role of change agents and care providers.

63.154 Basic Rockclimbing and Rappelling 2 Q.H.*

A training program designed to introduce potential rockclimbing leaders to all necessary facets of the sport. While successful completion of the program does not qualify a student to lead rockclimbing trips, it may help students to gain a better perspective of both the necessary skills and the leadership role in rockcraft. The program consists of a weekend of practical experience and two introductory discussion sessions at Bouvé. Program areas include activities and information regarding basic climbing and rappelling experience, knots, safety, belaying, equipment usage and care, and leadership. The lab fee includes lodging, meals, equipment use, and instruction.

63.155 Leisure and Lifestyles 4 Q.H.

The course focuses on aspects contributing to

*Lab fee required.

lifestyles and the role of leisure. Specific lifestyles are examined through case studies and guest presentations. Students have the opportunity to examine the effect of leisure on their present lifestyles and future aspirations.

63.156 Foundations of Psychiatric Services in Therapeutic Recreation 4 Q.H.

(Prereq. 19.105, 63.153, or permission of the instructor)

The course focuses on orientation to the foundations of mental health and variables affecting mental illness; examination of various psychiatric disorders and treatment modalities and the role of activity therapy in the treatment of mental illness; review of contemporary trends in psychiatry that pertain to therapeutic recreation.

63.157 Therapeutic Recreation with Developmentally Disabled Persons 4 Q.H.

Course offers a review of major phases of normal growth and development for the purpose of understanding the causes and impact of developmental disabilities. Emphasizes role of play experiences in achieving sequentialized skills and concepts, practices and procedures employed in program design.

63.161 Foundation of Leadership in Leisure Service 4 Q.H.

The course offers study of the basic principles of leadership relevant to the fundamentals of leadership in leisure services. Subjects include leadership styles, motivation, task sequencing, behavioral objectives, adaptation, and evaluation.

63.162 Overview of Physical Disabilities 4 Q.H.

The course offers a study of the humanistic approach to people with physical disabilities including amputations, traumatic conditions, sensory impairments, neurological, orthopedic, and cardiovascular disorders. Rehabilitation procedures and treatment, adjunctive therapies, prosthetics, orthotics, assistive devices and techniques, and reentry into the community from the individual, familial, and societal perspectives are discussed.

63.163 Concepts of Leisure: Sociopsychological Perspectives 4 Q.H.

The course focuses on exploration of the various sociopsychological perspectives of leisure and the relations of mores, social structure, roles, values, and personality to leisure expression. Investigation of other pertinent social and environmental factors that contribute to the phenomenon of leisure is included.

63.164 Leadership and Organization of Wilderness Recreation 4 Q.H.

The course offers in-depth investigation of the leadership, organization, planning, implementation, and evaluation of outdoor pursuits. Particular emphasis is placed on multi-day experiences in remote or wilderness settings. An

extended outdoor practicum in a wilderness setting is required.

63.165 Program Planning in Recreation 4 Q.H.

The course focuses on examination of program content, leadership, administration, and facilities associated with the effective delivery of leisure services under the auspices of public, private, religious, industrial, and voluntary agencies.

63.166 Arts and Crafts for Leisure 2 Q.H.

The course provides students the opportunity to discover, acquire, and adapt various craft skills such as inexpensive crafts, sculpture, painting, etc. The planning and programming of craft sessions are also covered.

63.167 Social Dance Leadership 2 Q.H.

The course offers a survey of folk, square, and ballroom dance appropriate for use with a wide range of age groups. Included are development of appreciation and understanding of the values and program potential of social dance; on-site experience and general techniques of leadership.

63.168 Budget Analysis 4 Q.H.

The course focuses on the study and use of analytical techniques that can improve budgeting decisions. Topics include cost-effectiveness and benefit-cost analysis, efficiency measures, pricing, forecasting, and present-value analysis for solution of capital and operating budget problems in the nonprofit and commercial recreation sectors.

63.169 Program Planning in Therapeutic Recreation 4 Q.H.

The course examines advanced planning of comprehensive therapeutic recreation services. Focus is on systems approach to planning for individuals and groups. Included are an intensive examination of the philosophy of therapeutic recreation; the study of the functional elements of activities, current legislation, and standards for service delivery.

63.170 Interpretation of Ecological and Social History 4 Q.H.

The course examines the employment of site visitations and problem-solving methods to investigate human interaction with and manipulation of the physical, biological, and social environment. The course provides the opportunity to acquire knowledge of ecosystem aspects which can be applied to environmental interpretation and decision-making sectors of ecosystem and recreation management.

63.171 Environmental Education 4 Q.H.

The study of the philosophy and history of environmental education in political, social, and educational movements. Exploration of methods of developing, teaching, and evaluating environmental education curricula applicable to

schools, camps, parks, and environmental centers.

63.172 Seminar on Environmental Issues and Legislation 4 Q.H.

The course offers study of the development of attitudes toward the environmental and critical investigation of the history of the environmental movement. Investigation of current environmental issues and laws affecting our ecosystem and lifestyles through integrating theories from sociology, ecology, economics, and politics. Exploration of degrees of ecological and social constraints on future growth and definition of alternative futures.

63.173 Leisure and the Community School 4 Q.H.

The course provides exploration (through class lectures, discussions, readings, and on-site visits) of the theoretical, operational, and motivating aspects of the community school concept. An opportunity to investigate the complex role played by leisure in the community school.

63.174 Elements of Outdoor Recreation Planning 4 Q.H.

The course offers exploration of the nature and significance of the outdoor recreation experience and how our natural resources can optimally meet people's needs. Focus is on the elements of outdoor recreation planning: identification, evaluation, assessment, and implementation. Relation of social groups, natural resources, and environmental concerns to outdoor recreation planning are included.

63.212 Leisure Counseling 4 Q.H.

This course provides students an opportunity to develop fundamental group counseling skills through the use of specialized strategies and traditional verbal counseling techniques. Major focus is on lifestyle awareness counseling.

63.249 Process of Aging 3 Q.H.

The course covers the study of phases of aging; discussion of the physical, social, and emotional changes and problems that face the aged; the study of types of services offered to senior citizens, and the sources of funds allocated to sponsor such services. The role of recreation is emphasized.

63.250 Group Dynamics 3 Q.H.

The study of human behavior in groups is approached through lectures, reading, and structural group experiences. Major areas of concentration include communication, leadership, decision making, and evaluation of the group process.

63.257 Workshop Design 3 Q.H.

The course provides supervised practical experience in developing, implementing, and evaluating a workshop.

63.260 Administration of Recreation and Parks 4 Q.H.

The course focuses on administration procedures of tax-supported recreation and park operations. Concentration on legality commissions, area and facility design, personnel policies, and problem solving related to administration and management.

63.261 Commercial Recreation Management 4 Q.H.

Course offers an examination of commercial and private sector recreation services. Case studies, workshops, and practical problems are related to managing leisure opportunities for resorts, country clubs, theme parks, tourism, sports clubs, manufacturing and merchandising, and industrial recreation.

63.264 Program Evaluation in Recreation 4 Q.H.

The course examines comprehensive systems for evaluating program effectiveness as it relates to the consumer of recreation services. Major emphasis placed on developing an evaluation system for an agency of the student's choice. Case studies are drawn from the public, nonprofit, and commercial sectors.

63.268 Urban Recreation 4 Q.H.

The course provides an examination of the different cultural and sociological patterns of various ethnic groups who live in an urban setting. Various recreational activities are suggested for each group. Other pertinent recreational issues common to the urban community are studied.

63.279 Internship Seminar 1 Q.H.

Course offers preparation for professional field assignment in a leisure service setting. Focus is on identification and assessment of student career goals, analysis of previous volunteer and/or employment experiences, professional involvement, and facilitation of the internship placement process.

63.280 Internship in Recreation and Leisure Services 16 Q.H.

Professional field assignment in leisure service settings designed to prepare students for professional career choices. Supervision by faculty, conferences with professional staff, and seminars. Ten-week internship.

63.285 Research Methods 4 Q.H.

Study of basic statistics, the use of experimental and quasi-experimental design, sampling, instrumentation, data collection, and analysis as applied in recreation and leisure studies.

63.290 Research Applications 4 Q.H.

The course examines the use of research methods in selected professional applications, ranging from the ongoing research of Departmental faculty to student-originated studies.

63.291, 63.292, 63.293, 63.294 Independent Study
Under the guidance and direction of a program adviser, students are given the opportunity to conduct projects related to their professional interests. Credit of one, two, three, or four quarter hours.

Physical Therapy

64.114 Introduction to Physical Therapy 2 Q.H.
The course provides orientation to the field of physical therapy and its role in the health professions; theory and practice in applied body mechanics and basic procedures related to patient management.

64.115 Introduction to Physical Therapy 2 Q.H.
(Prereq. 10.105, 11.171, 11.173, 12.107, 18.143, and 18.142)

The course provides practice in the preparation of patients and equipment for various treatment procedures. Theory demonstration and practice in heat, light, and hydrotherapy.

64.123 Clinical Gross Anatomy 6 Q.H.*
(Prereq. 18.144 and 18.148)

The course covers the structure and function of the human body with particular emphasis on the skeletal, muscular, nervous, and cardiovascular systems. Clinical applications. Lecture and laboratory.

64.125 Physiology for Physical Therapists 3 Q.H.
(Prereq. 18.144, 18.148, and 64.115)

The course covers neuromuscular, cardiovascular, and respiratory physiology applied to physical therapy.

64.130 Clinical Kinesiology 4 Q.H.*
(Prereq. 64.123 and 64.125)

The course covers musculoskeletal function with emphasis on the mechanical and physiological factors involved. Clinical applications to normal and pathological movements.

64.141 Physical Therapy I 2 Q.H.
(Prereq. 18.148, 64.115, and 18.144)

Course offers theory, demonstration, and practice in massage integrated with other treatment procedures. Case studies.

64.142 Physical Therapy II 3 Q.H.
(Prereq. 64.123, 64.125, and 64.141)

The course covers evaluation procedures: theory, demonstration, practice, and planning.

64.143 Physical Therapy III 4 Q.H.
(Prereq. 64.123, 64.125, 64.141, and 64.234)

This course covers basic therapeutic exercise: theory, demonstration, practice, and planning.

63.299 Senior Seminar in Contemporary Issues and Trends in Recreation and Leisure 4 Q.H.
Through extensive literature review, the course offers examination and discussion of contemporary issues and trends in the field of recreation and leisure. Focus is on critical aspects of leisure services: legislation, consumer advocacy, professional development, research, and innovations for the improvement of service delivery.

64.148 Physical Therapy V (continued) 1 Q.H.
(Prereq. 64.130, 64.142, 64.143, 64.229 and 64.256)

Topics include neurodevelopmental treatment, neurophysiological theory, and clinical application of facilitation and inhibition techniques to enhance motor control as advocated by the Bobaths.

64.149 Clinical Seminar 2 Q.H.
(Prereq. 64.156 and 64.234)

Selected topics related to clinical aspects in physical therapy. Interpersonal relationships, ethics, and teaching methods.

64.156 Physical Therapy IV 3 Q.H.
(Prereq. 64.130, 64.142, 64.143, and 64.229)

Course covers theory, demonstration, and practice in prosthetics, orthotics, and advanced functional training of spinal cord injured patients.

64.167 Research for Physical Therapy 4 Q.H.
(Prereq. Satisfactory attainment in all prior professional courses)

The course covers introduction to research design, analysis of scientific and medical literature, and preparation of an independent research proposal; electromyography.

64.169 Physical Therapy VII 2 Q.H.
(Prereq. 64.142, 64.229, and 64.251)

The course covers theory, demonstration, and practice in electrical testing and treatment procedures.

64.171 Physical Therapy VI 2 Q.H.
(Prereq. 64.130, 64.142, and 64.143)

Respiratory physical therapy: theory, demonstration, and practice in the management of medical and surgical chest conditions. Introduction to respiratory mechanical equipment and cardiopulmonary resuscitation.

64.173 Physical Therapy in the Health Care System 3 Q.H.
(Prereq. 64.149 and 64.184)

Concepts of rehabilitation and community health. Emphasis is on the role of the physical therapist as a member of the health team. Class discussion and seminar.

*Including lab.

64.176 Administration 3 Q.H.

(Prereq. 64.184)

Concepts in administration and management applied to physical therapy.

64.178 Physical Therapy VIII 2 Q.H.

(Prereq. Satisfactory attainment in all prior professional courses)

Analysis and comparison of methods of physical therapy evaluation and treatment, with special emphasis on therapeutic exercise. Treatment planning for various problems, with emphasis on rationale and selection of treatment alternatives.

64.182 Psychosocial Aspects of Illness 3 Q.H.

(Prereq. 64.149 and 64.184)

The course examines interpersonal relationships among patients, families, health professionals, and society with reference to the impact of and reaction to illness.

64.184 Supervised Clinical Education I 5 Q.H.

(Prereq. Satisfactory attainment in all prior professional courses)

An introduction to clinical experience providing the student with opportunities to practice various skills in the evaluation and treatment of patients under supervision. Emphasis is placed on an understanding of treatment planning. Five weeks during Quarter 9 of the junior year in the Boston area.

64.194 Supervised Clinical Education II

(Prereq. Satisfactory attainment in all prior professional courses)

Advanced clinical education providing the student with further opportunities to practice various phases of physical therapy under supervision in preparation for assuming the role of a qualified physical therapist. Assignments in Massachusetts and other states. Twelve weeks during senior year.

Required for graduation from the physical therapy program.

64.229 Clinical Medicine II 3 Q.H.

(Prereq. 64.123, 64.125, and 64.257)

Orthopedic conditions and their medical, surgical, and physical therapy treatment.

64.234 Clinical Psychiatry 2 Q.H.

(Prereq. 19.106; physical therapy students only)

Review of psychiatric categories, including consideration of etiology and treatment. Psychosocial variables significant in the management of patients with whom the physical therapist is concerned.

64.239 Investigative Studies 6 Q.H.

(Prereq. Satisfactory attainment in all prior professional courses)

The course covers selected modules related to current practice in physical therapy; completion of research projects.

64.251 Neuroanatomy 4 Q.H.*

(Prereq. 64.143)

Morphology and function of the human nervous system. Abnormalities of structure and function of the nervous system. Lecture and laboratory.

64.255 Clinical Medicine III 3 Q.H.

(Prereq. 64.229, 64.251, and 64.257)

The course focuses on pediatrics and neurology as related to conditions commonly treated by physical therapists.

64.256 Physical Therapy V 4 Q.H.

(Prereq. 64.130, 64.142, 64.143, and 64.229)

Theoretical basis and clinical application of the neurophysiological approaches to treatment: Brunnstrom, Rood, and proprioceptive neuromuscular facilitation techniques.

64.257 Clinical Medicine I 4 Q.H.

(Prereq. 18.144 and 18.148)

The course covers general medicine, laboratory medicine, and pathology as related to conditions commonly treated by physical therapists.

School and Community Health Education

65.110 Foundations of Health Education 2 Q.H.

Provides opportunities for learners to investigate the broad spectrum of career possibilities in community and school health education and to ascertain their potential roles in the field. Philosophy of health education, the conceptual approach, and trends in health education are considered.

65.114 Mental Health 4 Q.H.

An investigation of mental illness and well-being as they relate to total health, with concern for the factors that influence mental and emotional behavior. Various approaches to mental health education in school programs included.

65.116 Nutrition 4 Q.H.

(Prereq. 12.102, majors only)

This course offers the student the opportunity to learn and evaluate nutrition information both as a future educator and as a consumer. The chemical, biological, and physiological basis of nutrition are explained.

65.117 Public Health 4 Q.H.

History and overview of public health agencies and the organization of services for meeting community health needs at the local, state, federal, and international levels. Focus is on today's major health problems.

*Including lab.

65.131 Current Issues in Health**4 Q.H.**

Focus is on personal health issues; topics may include mental health, human sexuality and reproduction, drug use and abuse, nutrition, communicable and chronic diseases, consumer health, and environmental concerns. Emphasis is placed on issues of concern to the participants.

65.132 Death Education**4 Q.H.**

An interdisciplinary approach to the contemporary issues involved in death and dying. The course is designed to better prepare the student to: 1) assist the dying person in achieving an "appropriate" or "healthy" death; 2) understand, interact, and intervene with the suicidal individual; 3) cope with the loss of a significant other; and 4) prepare for one's own death.

Death is examined from a lifecycle approach—views of death from childhood to old age are investigated. Various value-clarifying activities and exercises will be utilized in exploring the student's attitudes and feelings toward death. In addition, the dynamics of grief, bereavement, and mourning are studied with the concept of "loss" being viewed from a "stress perspective." The potential constructive and destructive implications of bereavement on health and well-being are explored, with discussion on theory and research. Finally, the relation between stress, personality, and terminal illness and the empirical data in this area will also be examined. Overall, the goal of the course is to stimulate the student to act to attain life's priorities and values and to improve health in a Maslowian self-actualizing sense.

65.140 Longevity and Aging**4 Q.H.**

Study of the biological, psychological, and sociological aspects of human aging. Consideration is given to the importance of one's current lifestyle in relation to the phenomenon of longevity and the quality of life.

65.160 Instructional Resources**2 Q.H.**

Introduction to the use of audiovisual media as educational tools. Production of slide presentations, transparencies, bulletin boards, displays, etc., is included. Opportunities are provided for experiences in operating selected equipment.

65.191 Independent Study I**1 Q.H.****65.192 Independent Study II****2 Q.H.****65.193 Independent Study III****3 Q.H.****65.194 Independent Study IV****4 Q.H.**

Designed to provide the student with an opportunity for concentrated planning and research. In-depth study may be carried out in a topic area of health education. Outline of proposed study must be submitted for departmental approval.

65.208 First Aid**2 Q.H.**

Instructs students in principles of first aid and skill competencies necessary to care for selected injuries and to meet certain emer-

gencies. Successful completion of the course leads to certification in first aid by the American Red Cross.

65.209 Introduction to Safety**2 Q.H.**

(Prereq. 65.110)

Introduces the principles and fundamentals of safety education as they relate to people in their environment. Concerns safety as a social problem; considers major accident areas, accident causes, and liability; and analyzes possible solutions to accident problems.

65.217 Teaching Procedures/Curriculum In Health Education In School and Community**4 Q.H.**

The prospective health educator is introduced to health education curriculum, techniques of planning, and pertinent methods and materials in school and community health education.

65.218 Public Health**3 Q.H.**

(Prereq. Pharmacy majors only)

Principles of public health, with particular emphasis on the emerging patterns of community organization and activities in the public health field.

65.219 Evolving Patterns of Community Health Education**4 Q.H.**

Principles of community health, with emphasis on contemporary local, national, and international organizations for meeting health problems; health care delivery, consumer health issues, environmental health, community resources, and the role of health education in the community.

65.220 Community Health**4 Q.H.**

Focus is on today's major community health problems, with an overview of the organization of services for meeting community health needs at the local, state, federal, and international levels.

65.222 Drug Use and Abuse**4 Q.H.**

The use, misuse, and abuse of drugs in our society, including prescription and nonprescription drugs, alcohol, caffeine, and nicotine, and the physiological, psychological, and sociological effects on humans are considered. A rational perspective from which to explore the interrelations among history, prevailing attitudes, environmental differences, and drug-taking behavior is presented. Various approaches to drug education in school/community programs are discussed.

65.223 Human Sexuality and the Family**4 Q.H.**

(Prereq. 50.131)

Physical, psychological, social, historical, semantic, and comparative cultural aspects of human sexuality; needs and problems at several stages of maturation, including various approaches to sex education in the school.

65.225 Communicable and Degenerative Diseases**4 Q.H.**

The disease immunity process, with emphasis on prevalent communicable diseases in the United States today and their transmission; chronic diseases, cardiovascular diseases, cancer, diabetes, and other constitutional and degenerative diseases and disorders that affect the nation's health. Predominant themes are personal health attitudes and behaviors. Personal health responsibility is analyzed.

65.233 Organization and Administration of School and Community Health Education**4 Q.H.**

Principles and methods of organization and administration of school and community health education programs; ethics, personnel, budget, facility management, and priorities.

65.234 Health Problems of Youth**4 Q.H.**

Application of health concepts to assist youth in reaching a higher level of wellness through preventive measures. Significant physical, mental/emotional, and social health problems are identified so that they may be intelligently dealt with by health professionals, teachers, and adults concerned about youth.

65.235 Health Counseling**4 Q.H.**

The identification of physical, mental, emotional, and social health problems; remedial pro-

cedures; and counseling techniques to aid health educators to deal more intelligently with various health problems.

65.238, 65.239 Seminar**(each) 2 Q.H.**

(Prereq. for 65.238 is 50.141)

(Prereq. for 65.239 is 65.238)

Discussion of current problems and new developments as they relate to health education in school and in a variety of community settings. An introduction to research and scientific writing, culminating in a research project in an area of special interest, is included.

65.240 Student Teaching**12 Q.H.**

(Prereq. 65.217)

Observation and practical teaching experience in public school health education programs. Supervision and evaluation by personnel, in cooperating schools and by Boston-Bouv   College of Human Development Professions faculty; seminars.

65.241 Field Experience**12 Q.H.**

(Prereq. 65.217)

Observation and practical field experience in selected community health education settings. Supervision and evaluation by personnel, in cooperating agencies and by Boston-Bouv   College of Human Development Professions faculty; seminars.

Pharmacy and Toxicology

71.140 Pharmaceutics I**4 Q.H.**

(Prereq. 10.107, 11.175, 12.145, and 71.259)

The course focuses on the study of physico-chemical theories and principles and their application to pharmaceutical systems. Topics include intermolecular forces and states of matter, thermodynamics, solutions, ionic equilibria, solubility, complexation, interfacial phenomena, rheology, and coarse dispersions.

71.141 Pharmaceutics II**5 Q.H.**

(Prereq. 71.140)

The course focuses on the application of the fundamental principles of physical pharmacy to the formulation of pharmaceutical preparations. Emphasis is on pharmaceutical dosage forms, including both industrial formulation and extemporaneous compounding.

71.142 Pharmaceutics Laboratory**2 Q.H.**

(Prereq. 71.141 or concurrent enrollment)

The course focuses on the application of the fundamental principles and techniques of pharmaceutics to the laboratory preparation and use of various pharmaceutical drug products.

71.183 Special Research Project**(Clinical Pharmacy)****4 Q.H.**

(Prereq. Permission of instructor and program director)

This is a course of directed study or research in

clinical pharmacy, wherein the student may undertake in-depth investigation of an area of specialized interest.

71.184 Special Research Project**(Clinical Pharmacy)****4 Q.H.**

(Prereq. Permission of instructor and program director)

This is a course of directed study or research in clinical pharmacy, wherein the student may undertake in-depth investigation of an area of specialized interest.

71.185 Special Research Project**(Clinical Pharmacy)****4 Q.H.**

(Prereq. Permission of instructor and program director)

This is a course of directed study or research in clinical pharmacy, wherein the student may undertake in-depth investigation of an area of specialized interest.

71.186 Special Research Project**(Clinical Pharmacy)****4 Q.H.**

(Prereq. Permission of instructor and program director)

This is a course of directed study or research in clinical pharmacy, wherein the student may undertake in-depth investigation of an area of specialized interest.

71.193 Special Research Project**(Pharmacy Administration)****4 Q.H.**

(Prereq. Permission of instructor and program director)

This is a course of directed study or research in pharmacy administration, wherein the student may undertake in-depth investigation of an area of specialized interest.

71.194 Special Research Project**(Pharmacy Administration)****4 Q.H.**

(Prereq. Permission of instructor and program director)

This is a course of directed study or research in pharmacy administration, wherein the student may undertake in-depth investigation of an area of specialized interest.

71.195 Special Research Project**(Pharmacy Administration)****4 Q.H.**

(Prereq. Permission of instructor and program director)

This is a course of directed study or research in pharmacy administration wherein the student may undertake in-depth investigation of an area of specialized interest.

71.200 Pharmacy Externship**4 Q.H.**

(Prereq. Fifth-year standing)

A 520-hour (13 weeks x 40 hours/week) structured practicum in community pharmacy. The experience includes applied aspects of community pharmacy management; medication dispensing; and patient-oriented services such as prescription and non-prescription medication, consultation, and patient-profile monitoring.

71.213 Selected Topics In Clinical**Pharmacy I****4 Q.H.**

(Prereq. 71.268 and permission of instructor)

Designed to help students increase their understanding of selected diseases. Pathophysiology and diagnosis of the illness, as well as drug therapy and its relation to patient compliance and education. Provides greater depth than existing clinical pharmacy courses.

71.214 Selected Topics In Clinical**Pharmacy II****4 Q.H.**

(Prereq. 71.268 and permission of instructor)

This is a course designed to help increase the student's knowledge of selected disease entities. Topics will include pathophysiology and diagnosis of the illness as well as drug therapy and its relation to patient compliance and education. It will be more in-depth than existing clinical pharmacy courses.

71.218 Caring for Patients: Psychosocial**Aspects of Illness****4 Q.H.**

(Prereq. One course in psychology or sociology and previous experience working in a health profession; or permission of instructor)

The course is designed to help students integrate specific technical competence in the health professions with serious concern for psychological, social, and attitudinal factors in

illness and health care. Use of readings in behavioral science literature, film and videotape, case analyses, and personal reflection. Emphasis on applying knowledge and techniques of behavioral sciences to specific cases from students' clinical practice and work experience in the health professions. Examination of practitioner-patient relationships, patients' needs and responses in illness and treatment, and professional behavior in clinical settings.

71.220 Interpersonal Skills for Health**Professionals****4 Q.H.**

(Prereq. One course in psychology or sociology and previous experience working in a health profession; or permission of instructor)

The course is designed to apply the skills of interpersonal communication and group process to situations encountered in various health care settings. Through video-tapes of role playing, patient simulations, and actual patient and inter-professional encounters, the student is provided with an opportunity to learn the techniques of active listening, empathy, problem solving, conflict resolution, leadership, and cooperation.

71.227 Parapharmaceuticals**2 Q.H.**

Course focuses on the nature and application of various surgical devices, appliances, bandages, and hospital and sickroom supplies in patient care.

71.243 Pharmaceutical Jurisprudence**4 Q.H.**

(Prereq. Permission of instructor)

The course offers a comprehensive analysis and interpretation of laws relating to the practice of pharmacy. Federal and state food and drug laws, narcotics laws, Medicare and Medicaid regulations, and state pharmacy laws are discussed.

71.244 Hospital Pharmacy Management**4 Q.H.**

(Prereq. Senior standing or permission of instructor)

The factors involved in the operations and management of a hospital pharmacy.

71.245 Pharmacy Administration I**4 Q.H.**

(Prereq. Permission of instructor)

The course covers socioeconomic aspects of pharmacy: the government's relation to the pharmaceutical industry, trends in contemporary practice, third-party payment plans, macroeconomic impact on the industry, and the interaction of current concepts in pharmacy.

71.249 Drug Information and Evaluation**3 Q.H.**

(Prereq. Fifth-year standing or permission of instructor)

An introduction to the practice of drug information. Material covered includes the levels of practice, the availability of therapeutic reference sources, the use of abstracting and indexing systems, how to respond to drug information questions, and basic statistical data required to help understand the medical and pharmaceutical literature.

- 71.254 Clinical Pharmacy** 14 Q.H.
(Prereq. 71.250)
Students are assigned to a clinical site for five full days per week to observe patient response to medication and to evaluate and advise on all factors that may modify efficacy, safety, and economy of therapy. Campus seminar involves student presentations on current therapeutic topic.
- 71.259 Basic Pharmacy (replaces 71.260)** 3 Q.H.
The course provides an introduction to the general scope of pharmacy, including calculations, basic tools, and equipment used in the practice of pharmacy. The student is also introduced to various drug products, parapharmaceuticals, and medical terminology.
- 71.264 Biopharmaceutics/ Pharmacokinetics** 4 Q.H.
(Prereq. 71.141, 93.156, and 73.204)
Introduction to biopharmaceutics and pharmacokinetics. Emphasis is on the kinetics of drug absorption, distribution metabolism, and excretion in respect to dosage forms, drug interactions, and therapeutic response. Mathematical models for these processes are developed and applied to bioavailability data and the evaluation of drug therapy.
- 71.268 Clinical Pharmacotherapeutics** 5 Q.H.
(Prereq. 73.265 and 73.245)
The course covers discussion of common clinical laboratory tests, major disease states, and drug therapy for these conditions.
- 71.269 Pharmacokinetic Principles in Drug Therapy** 4 Q.H.
(Prereq. 71.264)
The course covers the monitoring, development, and modification of drug dosage regimens, and the pharmacokinetic factors influencing the selection of these regimens, for the various therapeutic categories of drugs.
- 71.284 Professional Practice Laboratory** 1 Q.H.
(Prereq. Senior standing or permission of instructor)
Compounding and dispensing medications. Emphasis is on patient counseling techniques and monitoring for appropriateness of therapy. Prescription compounding involves screening for incompatibilities. Also includes an introduction to the preparation of intravenous solutions.
- 71.288 Non-Prescription Medication** 4 Q.H.
(Prereq. 71.264)
A course designed to provide an overall view of the various types of "over-the-counter" medications. The directions and precautions for proper use of these preparations are discussed.
- 71.290 Hospital Pharmacy I** 4 Q.H.
(Prereq. Permission of instructor)
This course examines the relation of the pharmacy to the total hospital structure. Designing the physical plant, staffing, personnel management, and legal considerations of institutional practice.
- 71.291 Hospital Pharmacy II** 4 Q.H.
(Prereq. 71.290)
An in-depth analysis of various concepts relating to hospital pharmacy. The course includes comprehensive treatment of topics by other health professionals at their respective institutions.
- 71.292 Seminar in Community Pharmacy Management** 4 Q.H.
(Prereq. Permission of instructor)
A discussion course on all phases of community pharmacy operations with extensive utilization of the case method of instruction.
- 71.293 Pharmaceutics Special Research Project**
(Prereq. Permission of instructor(s) and program director) 4 Q.H.*
A course of directed study or research in one of the pharmaceutical sciences, wherein the student may undertake in-depth investigation of an area of specialized interest.
- 71.294 Pharmaceutics Special Research Project**
(Prereq. Permission of instructor(s) and program director) 4 Q.H.*
A course of directed study or research in pharmaceutics, wherein the student may undertake in-depth investigation of an area of specialized interest.
- 71.295 Pharmaceutics Special Research Project**
(Prereq. Permission of instructor(s) and program director) 4 Q.H.*
A course of directed study or research in pharmaceutics, wherein the student may undertake in-depth investigation of an area of specialized interest.
- 71.296 Community Pharmacy Management** 4 Q.H.
(Prereq. Permission of instructor)
The course focuses on the management requirements for establishing a community pharmacy. A comparative analysis of the prevailing types of organizations, locations, leases, business organization, staffing, plant layout and design, and financial factors.
- 71.297 Principles of Management** 4 Q.H.
(Prereq. Permission of instructor)
The course covers the fundamentals of business organization with emphasis on the qualitative and legal aspects of management. This course includes an analysis of the marketing structure of the drug trade, forces of organizations, personnel management, and decision-making theory using nonqualitative data.

*Lab fee required.

71.298 Financial Management 4 Q.H.

(Prereq. Permission of Instructor)

The course examines the fundamentals of accounting and finance with emphasis on their application to retailing and community pharmacy management. Accounting systems, analysis of financial statements, budgets, cash flow, taxation, and finance are covered in depth.

72.135 Anti-Infectives 5 Q.H.

(Prereq. 12.145, 18.131, and 18.132)

Course offers introduction to microbiology, microbial disease, and the chemotherapeutic agents used in their treatment; clinical applications of important current antibiotics.

72.230 Drug Analysis 5 Q.H.*

(Prereq. 12.119, 12.145)

The course offers a survey of the quantitative analytical techniques applicable to the evaluation and assay of natural and synthetic drugs and their formulations. Emphasis is on chromatographic, spectroscopic, and other instrumental methods, with selected laboratory experiments in the use of these as defined in official compendia.

72.253 Medicine Out of the Earth 4 Q.H.

(Prereq. 12.144, 12.145, 18.131, and 18.132)

This course focuses on the historical use of plants as drugs and their role in the development of modern medicinal and pharmaceutical preparations. Introduction to a variety of modern approaches to the discovery of new drugs is included, with reference to current research programs employing them. Films, slides, and demonstrations illustrate the techniques involved.

72.260 Basics of Nuclear Pharmacy 4 Q.H.

This course comprises the study of the physics, chemistry, and pharmaceutical use of radiopharmaceuticals. Methods for preparing and handling these drugs will be discussed in a practical way, as well as the rationale for their use in diagnosis and therapy.

72.261 Identification of Abuse Drugs 4 Q.H.

(Prereq. 12.171, 72.230, or equiv.)

The course provides an introduction to the chemistry, biological action, and methods of detection and assay of commonly abused drugs.

72.263 Medicinal Chemistry/ Pharmacology I 4 Q.H.

(Prereq. 18.132 and 12.145)

Course offers an introduction to the principles of pharmacology and medicinal chemistry applied to the discovery of drugs and their therapeutic utility in man; a detailed discussion of drugs affecting the central nervous system, including therapeutic indications, adverse reactions, and mechanisms of action.

72.293 Special Research Project (Medicinal Chemistry) 4 Q.H.*

(Prereq. Permission of instructor and program director)

Course offers directed study or research in one of the medicinal chemistry areas. Students may undertake in-depth investigation of an area of specialized interest.

72.294 Special Research Project (Medicinal Chemistry) 4 Q.H.*

(Prereq. Permission of instructor and program director)

Course offers directed study or research in one of the medicinal chemistry areas. Students may undertake in-depth investigation of an area of specialized interest.

72.295 Special Research Project (Medicinal Chemistry) 4 Q.H.*

(Prereq. Permission of instructor and program director)

Course offers directed study or research in one of the medicinal chemistry areas. Students may undertake in-depth investigation of an area of specialized interest.

73.111 Drugs—Their Uses and Actions 4 Q.H.

Topics include background, classification, dose responses, untoward side effects, uses and commercial preparations of a broad series of drugs. (Not open to pharmacy, respiratory therapy, or nursing majors).

73.114 Basic Pharmacology 3 Q.H.

(Prereq. Permission of instructor)

This course provides students an opportunity to learn the classification mechanisms of action and uses of a broad spectrum of therapeutic agents. Dose response and untoward side effects are emphasized.

73.116 Pharmacodynamics 3 Q.H.

(Prereq. 18.148, 18.125, 18.120, 12.106, and 12.107)

This course provides introductory expositions of pharmacologic principles, with the pharmacotherapeutics of drug groups and individual drug substances of particular importance in treatment and diagnosis of disease.

73.117 Pharmacology for the Respiratory Care Practitioner 4 Q.H.

The course provides an orientation to pharmacology, including the scope of pharmacology definitions; drug standards; drug legislation; names, sources, and active constituents; and pharmaceutical preparations of drugs relating to the respiratory-care practitioner.

73.118 Poisons 4 Q.H.

(Prereq. Non-pharmacy majors)

This course presents an organized classification of chemicals (natural and synthetic) capable of potential harm to humans and their environment. Included are the effects, uses, treatments, and designs of poisons.

73.130 Toxicology Orientation**1 Q.H.**

An introduction to toxicology as it relates to clinical, environmental, and regulatory concerns. Includes research principles, clinical toxicology of drugs, water and air pollution concerns. An overview of the field for toxicology and science majors.

73.131 Laboratory Animal Science**4 Q.H.**

(Prereq. 18.135, 73.204, and/or permission of instructor)

A comprehensive examination of the role of the laboratory animal in biomedical research. Includes historical and legislative aspects of animal research, basic anatomy and physiology, genetics and nutrition, physiological parameters, animal health and disease, and experimental protocols.

73.202 Anatomy-Physiology**5 Q.H.***

(Prereq. 12.119 and 18.132)

The course covers structure and function of cells, tissues, and organs, including the muscular, immune, and nervous systems. The laboratory includes human skeletal anatomy and cat dissection. Both the lecture and laboratory sections of this course are oriented to students in the health professions.

73.204 Anatomy-Physiology**5 Q.H.***

(Prereq. 73.202 or permission of instructor)

The course covers structure and function of the various life-supportive systems not covered in the first quarter: cardiovascular, endocrine, gastrointestinal, pulmonary systems. Laboratory is devoted to basic principles involved in understanding life systems and cell function.

73.215 Drug Interactions**4 Q.H.**

(Prereq. 73.268)

The basic chemical-physical, pharmacodynamic, pharmacokinetic, physiological, and pathological factors associated with drug interactions are studied. The roles of these factors in the efficacy and safety of therapeutic drug regimens involving major pharmacological classes of drugs are discussed.

73.229 Pharmacology Laboratory I**1 Q.H.***

(Prereq. 72.263)

Drug actions are observed in intact animals. The signs and symptoms are related to mechanisms of drug action and the integration of physiological systems. A major goal is the consolidation and integration of material previously presented in texts and didactic courses.

73.230 Pharmacology Laboratory II**1 Q.H.***

(Prereq. 73.229)

Basic principles of pharmacology and pharmacokinetics are observed using diverse experimental model systems. Drug action in these model systems demonstrates how pharmacological knowledge is obtained.

73.245 Introduction to Pathology**4 Q.H.**

The course focuses on basic concepts of pathology for the pharmacy student, with emphasis on disease processes and alterations of normal biochemical mechanisms.

73.247 Toxicology**4 Q.H.**

(Prereq. 72.263)

The course focuses on principles of toxicology, including FDA requirements relating to new drugs, environmental and other factors affecting the toxicity of therapeutic agents, mechanisms of toxicity, and clinical applications.

73.248 Neuropharmacology**4 Q.H.**

(Prereq. 73.264)

Current ideas and developments in neuropharmacology (the study of drugs that affect neural tissue) are presented in lectures and discussion sections. The cellular and biochemical bases of neural function are reviewed. Neurohumoral control of normal body functions and the mechanisms through which drugs can alter these functions are emphasized. Critical evaluation of current research literature emphasizes the methodologies of the field.

73.253 Fundamental Principles of Systemic Toxicology

(Prereq. 72.263)

4 Q.H.

Course offers a presentation of the principles of toxicology with reference to mode of toxic damage at the cellular and systemic levels. The course includes a discussion of the basic concepts used in evaluation of toxicity and the basic mechanisms through which toxic drug interactions are induced.

73.254 Chemical and Analytical Toxicology

(Prereq. 72.263 and 73.253)

4 Q.H.

Course offers a presentation of the structure activity approach to toxicology of chemical classes of compounds. The methodology employed to evaluate the safety of chemicals is presented.

73.256 Toxicology Laboratory**1 Q.H.***

(Prereq. 73.253, 73.254, and a course in statistics)

Principles and experimental methods in toxicology are presented. Animal handling, biochemical techniques, and morphological demonstration of toxic injury are included.

73.264 Pharmacology/Medicinal Chemistry II**6 Q.H.**

(Prereq. 72.263)

Continuation of 72.263. An interdisciplinary approach to the fundamental chemical and pharmacological principles of drug action. A discussion of structure-activity relationship, absorption characteristics, metabolic fate, pharmacodynamics, and therapeutic application principally of those drugs acting at sympathetic and neuroeffector junctional sites.

* Lab fee required.

73.265 Pharmacology/Medical Chemistry III

6 Q.H.

(Prereq. 73.264)

A continuation of 73.264 with special emphasis on drugs affecting the hematopoietic systems, the kidneys, and the endocrine and reproductive systems.

73.293 Special Research Project

(Pharmacology)

(each) 4 Q.H.

(Prereq. Permission of instructor and program director)

This is a course of directed study or research in pharmacology/toxicology wherein the student may undertake in-depth investigation of an area of specialized interest.

73.294 Special Research Project (Pharmacology)

(Prereq. Permission of instructor and program director) **4 Q.H.***

This is a course of directed study or research in pharmacology/toxicology wherein the student may undertake in-depth investigation of an area of specialized interest.

73.295 Special Research Project (Pharmacology)

(Prereq. Permission of instructor and program director) **4 Q.H.***

This is a course of directed study or research in pharmacology/toxicology wherein the student may undertake in-depth investigation of an area of specialized interest.

Nursing

80.207 Nursing

7 Q.H.

(Prereq. 80.205)

The nursing process is continued and implemented in more complex situations. Assessments of client/patient status and nursing interventions are centered on individuals with pathophysiological and psychological disturbances. Major content areas addressed are: adaptation to inflammations, immunity, stresses of pre- and post-operative experiences, and metabolic responses related to alteration in health status. The effects of the client/patients' altered status on family members are explored. Students are introduced to drug therapy and begin administration of medications. Under faculty guidance, students develop a teaching plan and nursing care analysis for selected clients. Learning experiences are planned for students to provide for continuity of patient care through collaboration with clients, health team members, and appropriate community agencies.

80.209 Transition

9 Q.H.

(Prereq. 12.106-107, 18.141-142, 18.143-144, 18.148, 19.105-106, 18.120)

The first nursing course for Registered Nurse students in the Baccalaureate Degree program introduces the purposes and objectives of this program and the philosophy of baccalaureate education. It also broadens students' perspectives of professional nursing, and provides opportunities to complement and validate through guided and independent study students' knowledge of roles and role conflicts, the communication process, group dynamics, and the nursing process, specifically with those patients experiencing the stresses of aging, chronic and long-term illness, and death. Additionally the course provides opportunities to understand human nutritional needs with

specific emphasis on the aged and chronically ill individual.

80.211 Dynamics of Development in Health Promotion I

4 Q.H.

(Prereq. Open to students in Nurse Practitioner Program only)

This course provides an intensive period of instruction during which the student is immersed in theory and practice essential to the comprehensive knowledge of the subject. It forms the theoretical foundation upon which the majority of the program courses are built. It details child and adolescent development according to three growth cycles: (1) the initial period of growth from conception through toddlerhood; (2) the second period of growth from the pre-school years through the early school years; and (3) the third period from pre-adolescence through adolescence. Within each growth period, those systems which are most critical to normal development are studied.

The emotional and behavioral component of the course is taught parallel with the physical, with emphasis on the interrelation among the emotional, social, intellectual, moral, and biologic components. The comprehensive study of each growth cycle is intended to establish a firm understanding of the continuum of individual human progress to maturity. This perspective of continuity of human development of the whole individual forms the basis on which criteria for health care delivery are planned.

80.212 Dynamics of Development in Health Promotion II

4 Q.H.

(Prereq. 80.211; open to students in Nurse Practitioner Program only)

This course continues the study of human development throughout the life cycle with

focus on the biological, emotional, and social development during the adult years. Critical phases of development during early adulthood, the middle years, and aging are examined.

This course also addresses social, cultural, and religious influences on development. Participants are given the opportunity to expand their previous concepts of family dynamics in examining family interactions that take place during these life stages.

The central objective of this course is to broaden the students' theoretical foundation for practice and to provide a conceptual framework for family-centered health care.

80.213 Preventive Health Care I 3 Q.H.

(Prereq. open to students in Nurse Practitioner Program only)

This course begins the study of preventive health care by providing the opportunity for participants to apply knowledge of human development, family dynamics, physical assessment, and interviewing and counseling to the care of well children. Emphasis is placed on developing guidelines for the clinical management of well-child care. Participants study the integration of health maintenance, screening, and anticipatory guidance into a total plan of a well-child visit. Seminars allow participants the opportunity to apply theoretical concepts to real and simulated situations.

80.214 Preventive Health Care II 3 Q.H.

(Prereq. open to students in Nurse Practitioner Program only)

This course continues the study of preventive health care as part of primary care delivery for individuals and families, with emphasis on identification and appropriate intervention in a variety of situations that constitute a significant risk to the optimal development and adaptation of individuals from infancy through adult life. Concepts of epidemiology and community health are used in examining factors influencing the level of wellness in individuals and families. Participants explore the role of the nurse practitioner as primary care provider through weekly seminar discussions, an in-depth study of a major health risk, and application of learned material in their clinical practice.

80.215 Medical History and Physical Diagnosis 5 Q.H.

(Prereq. open to students in Nurse Practitioner Program only)

Physical Diagnosis applies concurrently learned theory of human development to history taking and physical examination of well children and adults. The course focuses on the theoretical background and skills necessary to take and record a complete health history and to perform and record a complete physical examination on children and adults according to the guidelines of the problem-oriented medical record.

A combination of lectures, discussions, and faculty-supervised clinical practice sessions is utilized. The student is provided with a medical practitioner and a nurse practitioner team model which emphasizes the collaborative interaction of the nurse practitioner and the physician.

A total of eight hours' clinical experience is required each week. Four to six hours per week of direct teaching and supervision during the first quarter by the physician preceptor in the student's own work setting are required to provide the clinical practice necessary for application of theory and development of skills. Special clinical teaching experiences with the clinical nurse preceptor will be arranged. In addition, individual clinical experiences will be arranged as the need arises.

80.216 Interviewing, Counseling and Family Dynamics 2 Q.H.

(Prereq. open to students in Nurse Practitioner Program only)

This course is designed to examine fundamental theory regarding individual and family dynamics with a major focus on interpersonal behavioral patterns. An integral part of the course is the presentation of techniques and approaches to interviewing and counseling to enhance the increased development of effective interviewing skills in providing anticipatory guidance and counseling to children, young adults, and families. The course meets two hours per week and includes theoretical content in the form of didactic lectures, audio-visual presentations, and small-group seminars to facilitate theoretical application to the clinical setting.

80.217 Nursing I 4 Q.H.

The first course in nursing introduces the student to concepts of health, the health care delivery system, professional nursing, roles in professional nursing, the scientific method of inquiry, and communications and group process. The course is designed to familiarize the student with the theories and principles of nursing and related material in the sciences and humanities. A variety of societal and environmental factors that affect the health care system in general and nursing practice in particular will be examined.

80.218 Nursing II 4 Q.H.

(Prereq. 80.217)

The second course in nursing introduces the student to the leadership role in group process, basic human needs, and the identification of personal and professional goals. The course continues with the scientific method of inquiry and enables the implementation of communications. The course is designed to allow the student to recognize and interpret his/her own health behavior patterns. By participating in small groups, the student implements the responsibilities of a group member and recognizes the

leadership role. The student will develop an understanding of the consumer role in the health care delivery system. By using a problem-solving approach in analyzing and evaluating situations, the student is able to develop a self-assessment and establish his/her own personal and professional goals.

80.219 Human Nutrition 4 Q.H.

The study of the science of nutrition provides the student the opportunity to plan and select a nutritionally adequate and prudent diet; recognize and combat food and nutrition misinformation; utilize objectivity when working with individuals to meet their nutritional needs; and recognize the importance of nutrition and its relation to health. The course will examine the physiological functions of the major nutrients and food sources, as well as common areas of consumer concern about nutrition.

80.220 Nursing 6 Q.H.
(Prereq. 80.217, 80.218, 80.219, 12.106, 12.107, 18.141, 18.142, 18.148)

This is the first nursing course with a clinical practicum. Students will implement the nursing process using Maslow's motivational theory for clients requiring assistance in meeting selected basic needs. Knowledge and skill in interviewing, health-team communication, and professional role are further developed.

80.221 Nursing 6 Q.H.
(Prereq. 80.220, 18.143, and 18.120)

Students in the second nursing course with a clinical practicum will continue to implement the nursing process using Maslow's motivational theory for clients requiring assistance in meeting selected basic needs. Learning experiences are planned for the student to gain knowledge and skill in patient education and health-team collaboration. Additional opportunity is provided for the student to further develop the professional role and interpersonal relationship skills.

81.201 Medical-Surgical Nursing 9 Q.H.
(Prereq. 80.207, 83.201, 73.116; 80.209—RNs only)

Focus is placed on the effects of episodes of acute illness on individuals, families, and society. Alterations and adaptations in physiology—characteristic of acute episodes of illness—and the nurse's role in intervention are discussed. Content also includes discussion of the impact of illness on patterns of living, needs for health teaching, and continuity of care. Guided clinical experiences are planned, with emphasis on the use of the nursing process and the development of those skills necessary to

plan and implement care for the adult who is in an acute care setting.

82.201 Maternal and Child Nursing 9 Q.H.
(Prereq. 19.141, 73.116, and 80.207 or 80.209)

The focus of this course is on the application of the nursing process in maintaining optimal health for child-bearing and child-rearing families from various cultural and social backgrounds. The student will examine individuals at selected developmental stages. Opportunity is provided for students to apply the nursing process in client-care settings and to assist families in coping with stresses that interfere with health. Learning experiences provided assist the student in furthering personal and professional development.

83.202 Psychiatric/Mental Health Nursing 7 Q.H.
(Prereq. 80.207 or 80.209)

This course is designed to help students develop knowledge of mental illness, understanding of the dynamics of human behavior, and skill in working with individuals and groups of patients in the prevention of mental illness and the promotion of mental health.

84.201 Community Health Nursing 9 Q.H.
(Prereq. 81.201, 82.201, 19.142, 20.100)

This course provides an opportunity for students to increase their understanding of the variety of ways in which families, groups, and communities organize to meet the health and welfare needs of their members. Particular attention is given to the role of the nurse in planning with individuals, families, groups, and community agencies to meet recognized needs. Themes occurring throughout the course include political implications of health care delivery and current research that affects family and group health and community nursing. Value clarification and cultural experience of nurse and client are also explored. Laboratory experience involves work with individuals, families, and communities.

85.201 Contemporary Nursing 9 Q.H.
(Prereq. 81.201, 82.201, and 20.100)

This senior-year nursing course includes lectures and seminars, with student participation in selection of learning experiences. Course varies to reflect current trends and issues in nursing and health care delivery. Students have the opportunity to demonstrate self-direction by defining their objectives for learning experiences, pursuing an area of nursing in which they are particularly interested, utilizing basic principles of research, and evaluating their own performance.

Health Professions

General Courses

86.102 Hospital Law 2 Q.H.

This course offers an analysis of the legal principles relating to medical and paramedical practice within a hospital environment. The common law and statutory rights of the hospital, practitioner, and patient are discussed.

86.103 Basic Medical Terminology 2 Q.H.

This course provides a study of the language of medicine and health care. Emphasis is on disease, procedures, and symptomatic terms and their definitions, word construction, analysis, and application. The student is provided an opportunity to acquire working knowledge of medical terminology.

86.107 Medical Terminology 4 Q.H.

The course offers a study of the language of medicine, including prefixes, suffixes, roots, abbreviations, and disease, operative, and drug terms. Also included are terms related to all area specialties. The terms are studied as they relate to a specific system of the body.

86.112 Foundations of Medical Science I 3 Q.H.

The course covers major disease problems in our society and modes of treatment. Included are discussion of organized care, diagnosis and treatment; consideration of reproduction, birth, and pediatrics.

86.113 Foundations of Medical Science II 3 Q.H. (Prereq. 86.112)

A continuation of 86.112, covering heart, cancer, stroke, blood and lymphatic diseases, accidents, and musculoskeletal, respiratory, and gastrointestinal diseases.

86.160 Introduction to Data Processing for the Health Services 4 Q.H.

This is an introductory course designed to introduce the student to the basic concepts of electronic data processing. Topics considered include input, output, storage, computation, and controls. The basic history of automation is reviewed and the concept of computer language is introduced utilizing FORTRAN. Simple problems are completed on an individual and group basis.

87.135 Professional Dynamics in the Health Care Delivery System 4 Q.H.

An examination of where health care is delivered, how it is financed, and who delivers it. Roles, responsibilities, academic preparation, and competencies of health practitioners are examined. Introduction to the humanistic dimensions of health professional education and practice, and orientation to professional organizations and professionalism are included.

Medical Laboratory Science

The Medical Laboratory professional courses are taught by University faculty, together with supportive clinical faculty.

87.100 Laboratory Medicine-Orientation 1 Q.H.

The course focuses on the history and development of the medical laboratory technologies and pathology.

87.101 Basic Medical Laboratory Science 4 Q.H.*

(Prereq. 18.132, 12.104, or 12.107)

Introductory course in the basic medical laboratory sciences; methods, principles, and theories of urinalysis and basic hematology.

87.102 Basic Medical Laboratory Hematology 2 Q.H.

Principles and procedures and basic medical laboratory hematology, including basic hemostasis, are covered.

87.103 Basic Medical Laboratory Immunohematology 2 Q.H.*

(Prereq. 87.132)

Basic principles in immunohematology and related techniques, with particular emphasis on

those procedures used in blood banking, are covered.

87.104 Basic Medical Laboratory Science Clinical Microbiology 4 Q.H.*

(Prereq. 18.132)

Basic principles and techniques of organism isolation, cultivation, and identification from clinical specimens are covered. Elementary serologic procedures will be discussed.

87.105 Basic Medical Laboratory Chemistry and Instrumentation 4 Q.H.*

(Prereq. 12.171 and 87.101)

Principles, procedures, and techniques of basic clinical chemistry and instrumentation.

87.106 Basic Electronics and Medical Laboratory Science Instrumentation 1 Q.H.

(Prereq. 87.155, 11.171 or concurrently)

The course covers electricity, electronics, and electronic components with application to medical laboratory instruments.

*Lab fee required.

87.109 Foundations of Clinical Laboratory Science 4 Q.H.

(Prereq. Admission to Physician Assistant Program)

Basic laboratory methods employed in primary care, including urinalysis, gram staining, hematocrit, hemoglobin, sedimentation rate, white cell count, and differential.

87.113 Basic MLS Clinical Immunology 3 Q.H.

Topics include basic principles of immunology with laboratory emphasis on immunodiagnostic techniques currently used in clinical laboratory practice.

87.114 Medical Mycology 2 Q.H.

Laboratory identification of clinically significant fungi with a discussion of modes and types of infections.

87.135 Professional Dynamics in the Health Care Delivery System 4 Q.H.

Course offers a survey of the roles, responsibilities, academic training, and competencies of practitioners within the College of Pharmacy and Allied Health Professions, as well as others. Discussion of manpower status and projections for the major health professions is included. Introduction to the humanistic dimensions of health care education and practice and orientation to professional organizations and professionalism are included.

87.141 MLT Applied Study in Clinical Microbiology 2 Q.H.

(Prereq. 87.100, 87.150, 87.151, 87.152, 87.153, 87.154, 87.155, and admission to AD-MLT Clinical Program).

Clinical practicum in microbiology at a Northeastern University-affiliated hospital providing AD-MLT-level instruction.

87.142 MLT Applied Study in Hematology 2 Q.H.

(Prereq. 87.100, 87.150, 87.151, 87.152, 87.153, 87.154, 87.155, and admission to AD-MLT Clinical Program)

Clinical practicum in hematology and coagulation at a Northeastern University-affiliated hospital providing AD-MLT-level instruction.

87.143 MLT Applied Study in Blood Banking 2 Q.H.

(Prereq. 87.100, 87.150, 87.151, 87.152, 87.153, 87.154, 87.155, and admission to AD-MLT Clinical Program)

Clinical practicum in blood banking at a Northeastern University-affiliated hospital providing AD-MLT-level instruction.

87.145 MLT Applied Study in Clinical Chemistry 2 Q.H.

(Prereq. 87.100, 87.150, 87.151, 87.152, 87.153, 87.154, 87.155, and admission to AD-MLT Clinical Program)

Clinical practicum in clinical chemistry and

urinalysis at a Northeastern University-affiliated hospital providing AD-MLT-level instruction.

87.150 Basic Medical Laboratory Science I 3 Q.H.*

(Prereq. 18.132 and 12.104, or 12.119)

Introductory course in basic medical laboratory science covers principles and theories of renal physiology, with laboratory emphasis on techniques for chemical and microscopic detection of normal and abnormal constituents.

87.151 Basic MLS Hematology 3 Q.H.

(Prereq. 18.132 and 12.104 or 12.119)

This introductory course in basic hematology procedures and principles covers hemoglobin, hematocrit, white and red blood cell counts, and white cell differentiation.

87.152 Basic MLS Hematology II 3 Q.H.

(Prereq. 87.151 or 87.101)

The course covers principles and procedures of hematology, with emphasis on hematologic cell maturation and morphology and basic hemostasis.

87.153 Basic MLS Immunohematology 3 Q.H.*

(Prereq. 18.132)

The course covers basic principles in immunohematology, with specific application to the A, B, O, and Rh blood group systems, antibody detection, and crossmatch design. Basic blood bank techniques to include blood typing and crossmatching.

87.154 Basic MLS Clinical Microbiology 6 Q.H.*

(Prereq. 12.104 or 12.119, and 18.132)

The course focuses on basic principles and techniques of organism isolation, cultivation, and identification from clinical specimens. Elementary serologic procedures are discussed.

87.155 Basic MLS Clinical Chemistry and Instrumentation 5 Q.H.*

(Prereq. 87.150 or 87.101)

The course covers principles of clinical chemistry with application to procedures and techniques. Laboratory emphasis on instrumental analysis of specific clinical chemical specimens.

87.162 Hematology Applied Study 3 Q.H.

(Prereq. Acceptance to MT Clinical Program)

Clinical practicum in applied hematology at an affiliated, accredited hospital medical technology program.

87.163 Immunohematology Applied Study 2 Q.H.

(Prereq. Acceptance to MT clinical program)

Clinical practicum in applied immunohematology at an affiliated, accredited hospital medical technology program.

* Lab fee required.

87.164 Clinical Microbiology Applied**Study 5 Q.H.**

(Prereq. Acceptance to MT Clinical Program)
Clinical practicum in applied microbiology at an affiliated, accredited hospital medical technology program.

87.165 Clinical Chemistry Applied Study 5 Q.H.**(Formerly 87.115)**

(Prereq. Acceptance to MT Clinical Program)
Clinical practicum in applied clinical chemistry at an affiliated, accredited hospital medical technology program.

87.180 MLT Seminar I 2 Q.H.

(Prereq. 87.100, 87.150, 87.151, 87.152, 87.153, 87.154, 87.155, and admission to AD-MLT Clinical Program)

The course offers a basic introduction to correlation of laboratory findings in hematology, blood banking, microbiology, and clinical chemistry, with appropriate referrals of laboratory information in working situation. Basic use of quality control.

87.181 MLT Seminar II 2 Q.H.**(Prereq. 87.180)**

Continuation of 87.180 and introduction to selected new laboratory techniques. Emphasis is on the role of the AD-MLT technician in a working laboratory.

87.190 Undergraduate Research 2 Q.H.**(Prereq. Special permission)**

The course examines special problems in laboratory medicine involving individual research under the direction of a faculty member.

87.204 Medical Parasitology 2 Q.H.**(Prereq. 87.154, 18.220, and 18.221)**

The course focuses on laboratory identification of parasites of human significance. Life cycles related to mode of infestation, effects on humans, and diagnostic form.

87.211 Hemostasis 2 Q.H.

Lecture/laboratory course in advanced hemostatic techniques. Theory and methodology will be stressed, along with interpretation of laboratory results.

87.213 Immunohematology 2 Q.H.***(Prereq. 87.103 and 87.153)**

This course offers advanced studies in antigen-antibody detection and problem solving through immunohematological tests. Discussion of related hematologic disorders and the medical/legal aspects of blood banking is included.

87.221 Medical Laboratory Management 2 Q.H.**(Prereq. Completion of clinical program)**

The course offers a survey of factors that relate to effective laboratory administration: hospital organizational structure, principles of

management and : supervision, cost accounting, purchasing, infection guidelines, legal responsibilities, and personnel relations.

87.222 Histochemistry 2 Q.H.***(Prereq. 87.252)**

The histochemistry of hemic cells and techniques used in diagnosis of hematological disorders are covered.

87.224 Advanced Microbiology II 2 Q.H.**(Prereq. 87.154 or permission of instructor)**

Topics include host and microbial interactions in disease produced by viral, rickettsial, chlamydial, mycoplasma, mycobacteria, and actinomyces, with discussion of disease states and laboratory diagnostic procedures.

87.225 Advanced Clinical Chemistry II 2 Q.H.**(Prereq. 87.155 or permission of instructor)**

Course includes current methodologies and instrumentation used in clinical chemistry to evaluate hormonal conditions and drug level monitoring.

87.226 Medical Laboratory Science**Education****2 Q.H.****(Prereq. Completion of clinical program)**

The course offers a survey of current topics in medical laboratory science education: developing objectives, methods of evaluation and certification, clinical instruction and evaluation, medical laboratory science curricula, and use of media and other methods of instruction.

87.232 Hematology II 3 Q.H.**(Prereq. 87.152 or permission of instructor)**

Topics include physiology of blood cells and bone marrow with a review of physiology of blood hemopoiesis; discussions of hematologic results as they relate to normal, anemic, and leukemic conditions.

87.234 Advanced Microbiology III 2 Q.H.**(Prereq. 87.154 or permission of instructor)**

Course covers host and microbial interactions in gastrointestinal, genitourinary, and respiratory tract infections; discussion of disease states and laboratory diagnostic procedures.

87.235 Advanced Clinical Chemistry III 2 Q.H.**(Prereq. 87.155 or permission of instructor)**

Course includes metabolism of and procedures for nucleic acids, amino acids, proteins, lipids, and carbohydrates.

87.242 Hematology IV — Hemostasis 3 Q.H.

Course offers advanced studies in hemostasis with emphasis on factor identification and problem solving of hemostatic problems.

87.244 Advanced Microbiology IV 2 Q.H.**(Prereq. 87.154 or permission of instructor)**

Topics include host and microbial interactions in closed-space infections and in disease produced by staphylococci and anaerobic organisms. Methods for antibiotic susceptibility

*Lab fee required.

testing and principles of infectious disease control are also included.

87.245 Clinical Chemistry IV 2 Q.H.
(Prereq. 87.155 or permission of Instructor)

Course includes a discussion of laboratory procedures used to evaluate acid-base balance, hepatic, renal, and gastrointestinal systems as well as vitamin and trace-metal blood levels.

87.250 Communications in the Health Sciences 4 Q.H.
(Prereq. 87.152, 87.153, 87.154, and 87.155)

The course examines communications in the medical scientific community, including journal articles, resource material, abstracts, and health-related interpersonal communications.

Health Record Administration

86.151 Health Record Science I 4 Q.H.
(Prereq. Two years of arts and sciences)

The course offers introduction to health records; history of the medical record and medical record forms. Included are a study of professional medical record administrators and their relation to the health facility, medical staff, and committees in the hospital. Quantitative analysis of medical records.

86.152 Health Record Science II 4 Q.H.
(Prereq. 86.151)

This course covers the numbering, filing, security, and preservation of medical records; principles of law related to patient care and medical records; emphasis on the rules of privileged communications and the release of information to agencies.

86.153 Health Record Science III 4 Q.H.
(Prereq. 86.152)

The course examines basic principles of compiling statistics for hospital and other health institutions. Topics include the preparation of the daily census and discharge analysis; monthly, annual, and special reports; birth and death certificates; principles of standardized nomenclature of diseases and operations and ICD-9-CM; and study of other indexes used in medical records departments.

86.154 Advanced Health Record Science IV 4 Q.H.
(Prereq. 86.153)

This course covers advanced aspects of health/medical record science. Special focus is on the management of record systems in ambulatory, long-term, home care, and psychiatric settings.

86.157 Seminar in Health Records 2 Q.H.
(Prereq. Senior status)

Case study and discussion are used to integrate the discrete skills and knowledge of the

87.253 Immunohematology 2 Q.H.
(Prereq. 87.153)

This course offers blood group systems, antibody identification, and advanced immunohematologic principles and procedures. Case studies will be presented.

87.280 MLS Special Topics 2 Q.H.
(Prereq. 87.150 through 87.155)

The course offers a comprehensive examination of one or more current topics in the clinical laboratory.

87.281 MLS Senior Seminar 2 Q.H.
The course provides a review of the undergraduate medical laboratory science courses.

professional curriculum into a meaningful whole by analysis of real and hypothetical problems. Coordination between the seminar and applied medical record science is emphasized.

86.158 Orientation to Medical Records I 1 Q.H.
This introductory seminar focuses on the issues, activities, and opportunities in the medical record profession.

86.159 Orientation to Medical Records II 1 Q.H.
Continuation of seminar that introduces the medical record profession. Focuses on the tools utilized by the medical record professional.

86.161 Quality Assurance 4 Q.H.
(Prereq. 86.153, 86.154; 86.107 or permission of Instructor)

This course is designed to provide the student with the opportunity to gain knowledge of the issues and problems involved in designing, implementing, and maintaining quality assurance programs for health-care facilities. An opportunity will also be provided for the student to gain the technical skills necessary to carry out all aspects of the audit process, emphasizing the professional's role as facilitator to physicians and other professional staff.

86.162 Management Principles in Health Care 4 Q.H.

This course is an introduction to basic management principles. It is designed so that the hospital (or health-care facility) can provide the major source of example and case study, giving students an opportunity to synthesize abstract principles with practical application.

86.163 Concepts and Application of Work Design 4 Q.H.
(Prereq. 86.162)

This course is designed as an introduction to systems analysis, its concepts, and techniques. Special application to health record management is stressed throughout the course.

86.164 Special Topics I 2 Q.H.

The course provides specialized study in medical records.

86.165 Special Topics II 2 Q.H.

The course provides specialized study in medical records.

86.166 Applied Health Statistics 4 Q.H.

(Prereq. Basic statistics course)

Designed to provide the health record student with the opportunity to learn to apply basic statistical techniques to the gathering, analysis, and interpretation of health care and medical record data, as well as the effective use of these tools in such areas as department management and research studies. Agencies involved in collecting statistical data will be reviewed, with the types and sources of information they require; the relation of statistics, epidemiology, and medical records will also be considered.

86.167 The Health Record Professional: Issues and Problems 2 Q.H.

(Prereq. Senior status)

This course provides the senior health record student with information on a range of topics that are germane to his/her professional role but that may not have been included in other professional courses.

86.168 Medical Computer Applications 4 Q.H.

(Prereq. EDP Course I)

This course covers utilization of electronic data processing in health care. Overview of current activities and their impact on future trends in health record management information will be discussed. The role of the RRA as an information specialist will be considered.

86.169 Independent Study 4 Q.H.

(Prereq. Permission of instructor)

This independent study project is designed to give students an opportunity to explore in depth a subject relevant to their interests. It is designed to give them the opportunity to study a problem, present a proposal, carry out a study or a course of action, and prepare both written and oral presentations of their activities.

86.173 Clinical Seminar 2 Q.H.

Designed to integrate the didactic and the clinical experience at an early stage, the course provides a formal means by which students can share clinical developments with each other. It is designed to give them an opportunity to improve their competency in specific areas of medical record practice.

86.257 Organization and Management of Medical Records Department I 4 Q.H.

The course focuses on the study of the hospital, in particular, patterns of organization within hospitals: lines of responsibility and authority, medical staff and administrative organization, hospital department functions and organization. Included are the study of fundamental

principles and successful practices in getting office work accomplished. Topics cover office management problems and their solutions; conceptual framework for the operation of essential management function; facilities, solutions, and contributions of the office.

86.258 Organization and Management of Medical Records Department II 4 Q.H.

The course focuses on the study of the development of an efficient medical records department in any medical care facility; application of the principles of organization and management in the development and administration of a system of medical information handling.

86.260 Applied Health Records Directed Practice I 3 Q.H.

(Prereq. 86.151)

Clinical practicum in medical record science in the general hospital.

86.261 Applied Health Records Directed Practice II 1 Q.H.

(Prereq. 86.260)

Clinical practicum in medical records science in specialized health settings.

86.264 Applied Health Records Science III 4 Q.H.

Clinical practicum in health/medical records management in the health-care facility.

86.265 Organization and Management of Medical Record Department I 4 Q.H.

This course focuses on the medical record department within the health care setting. Lines of responsibility and authority, medical staff and administrative organization, hospital department functions and organization are examined, as are fundamental principles and successful practices of office organization. An opportunity is provided for the student to develop the technical skills necessary to develop organization charts, policies, job descriptions, and job procedures.

86.266 Organization and Management of Medical Record Department II 4 Q.H.

(Prereq. 86.265)

This course focuses on the medical record department within the health care setting. Budget and cost control mechanisms, organized labor and collective bargaining, office environment and layout, and the impact of state and federal regulations on medical record practices are examined. An opportunity is provided for the student to develop the technical skills necessary to plan and analyze budgets, to plan and design office layouts, and to evaluate the impact of regulations on particular medical record applications.

86.267 Organization and Management of Medical Record Department III 4 Q.H.

(Prereq. 86.266)

This course focuses on the medical record department within the health care setting.

Orientation programs; training programs; in-service education; interviewing, hiring, counseling, motivating, and disciplining employees; and communication skills are examined. An opportunity is provided for the student to develop an orientation and training program, an in-

service presentation. Role-playing sessions and case studies are used to develop skill in interviewing, hiring, counseling, disciplining, and motivating employees. Emphasis is placed on verbal skills.

Respiratory Therapy

86.201 Professional Practice Laboratory I 1 Q.H.
(Prereq. 86.221 concurrently)
This lab is designed to provide practice in basic care skills through laboratory exercises and simulation of patient-care situations.

86.202 Professional Practice Laboratory II 1 Q.H.*
(Prereq. 86.201, 86.222 concurrently)
The lab is designed to provide students with hands-on experience in working with respiratory therapy equipment. Simulated patient-management problems will be set up in the lab to provide problem-solving experience.

86.203 Professional Practice Laboratory III 1 Q.H.*
(Prereq. 86.202, 86.233 concurrently)
The lab is designed to provide students with hands-on experience with respiratory therapy procedures. Simulated patient-management problems will be set up in the lab to provide problem-solving experience.

86.204 Professional Practice Laboratory IV 1 Q.H.*
(Prereq. 86.203, 86.234 concurrently)
The lab is designed to provide students with an opportunity to acquire experience in working with respiratory therapy life support equipment. Simulated critical care problems will be set up in the lab to provide problem-solving experience.

86.205 Cardiopulmonary Laboratory Practice 1.Q.H.*
(Prereq. 86.225 concurrently)
This course is designed as the laboratory portion of Cardiopulmonary Laboratory Technology. Focus is placed on the techniques of pulmonary functions testing, blood gas analysis, and cardiovascular testing commonly done in the clinical setting.

86.211 Respiratory Therapy Seminar I 1 Q.H.
This is a survey course designed to introduce the beginning respiratory therapy student to the role of respiratory therapists in health-care delivery.

86.212 Respiratory Therapy Seminar II 1 Q.H.
This is a course designed to introduce the beginning student to therapeutic modalities of respiratory care.

86.213 Respiratory Therapy Seminar III 1 Q.H.
Continuation of 86.212, including introduction to life-support systems.

86.214 Clinical Seminar I 1 Q.H.
(Prereq. 86.228 concurrently)
The seminar is designed to discuss clinical topics and respiratory-care problems encountered during clinical practice in the hospitals.

86.215 Clinical Seminar II 1 Q.H.
(Prereq. 86.229 concurrently)
The seminar is designed to discuss clinical topics and critical care problems encountered during clinical practice in the hospitals.

86.216 Advanced Respiratory Therapy Seminar I 1.Q.H.
(Prereq. 86.271 concurrently)
This course is designed to complement 86.272, Advanced Life Support Systems I. Discussion of current clinical problems related to life-support systems will emphasize problems encountered in the hospital.

86.217 Advanced Clinical Seminar II 1 Q.H.
(Prereq. 86.272 concurrently)
This course is designed to complement 86.272 Advanced Life Support Systems II. Discussion of current clinical problems and research related to life-support systems will emphasize problems encountered in the hospital.

86.218 Advanced Clinical Seminar III 1 Q.H.
(Prereq. 86.279 concurrently)
Course is designed to complement 86.287, Practicum in Critical Care. Discussion of current clinical problems and research related to critical-care problems is emphasized.

86.219 Advanced Clinical Seminar IV 1 Q.H.
(Prereq. 86.280 concurrently)
Continuation of 86.218. Complements 86.287, Practicum in Critical Care.

*Lab fee required.

86.221 Introduction to Patient Care 2 Q.H.

(Prereq. Satisfactory completion of the first-year curriculum)

This course is designed to provide an opportunity for the student to gain knowledge and understanding of basic patient-care skills, including moving and positioning of patients, infection control, basic observation and assessment skills, and familiarity with the techniques of cardiopulmonary resuscitation. An opportunity will also be provided for the development of the student's interpersonal and communication skills.

86.222 Introduction to Respiratory Care 3 Q.H.

(Prereq. 86.221 and pharmacology concurrently)

This course is basic to all other professional respiratory therapy courses. Focus is on the theory and application of medical gas administration and humidity/aerosol therapy.

86.233 Respiratory Care for the Medical and Surgical Patient 4 Q.H.

(Prereq. 86.222)

This course is a continuation of the Introduction to respiratory therapy. It is designed as the didactic portion of beginning clinical experience on noncritical patients. Focus is placed on respiratory-care problems following major surgery and those problems related to medical patients.

86.234 Respiratory Care for the Critical Patient 4 Q.H.

(Prereq. 86.233)

The course is the last in a sequence of three directly related to the theory of respiratory therapy procedures. It is designed as the didactic portion of clinical experience on critical patients. Focus is placed on respiratory-care problems encountered with patients in intensive care units.

86.225 Cardiopulmonary Laboratory Techniques 3 Q.H.

(Prereq. 86.227 and permission of instructor)

This course is designed to provide the student with an opportunity to gain knowledge and background in the principles, theory, and procedures encountered in a clinical cardiopulmonary laboratory. Focus will be placed on the physiologic foundations of cardiopulmonary testing.

86.226 Cardiopulmonary Physiology 4 Q.H.

(Prereq. Satisfactory completion of the first-year courses)

The course is designed to provide a detailed introduction to the structure and function of the cardiopulmonary systems. The material presented will emphasize clinical relevance and application in preparation for the basic courses in the clinical sciences.

86.227 Cardiopulmonary Disease 4 Q.H.

(Prereq. 86.226)

This course is designed to provide a detailed introduction to the clinical diagnostic procedures employed in evaluating cardiopulmonary patients and description of the etiology, pathophysiology, diagnosis, and treatment of major cardiopulmonary diseases.

86.228 Clinical Practice I 6 Q.H.

(Prereq. 86.222 completed and 86.233 concurrently)

This is the first course designed to provide clinical experience in hospitals. Focus is on respiratory care for noncritical patients. Emphasis is placed on infection control, medical gas administration, humidification of medical gases, aerosol therapy, chest physiotherapy, deep breathing treatments, and the administration of aerosol medications.

86.229 Clinical Practice II 6 Q.H.

(Prereq. 86.233 completed and 86.234 concurrently)

This course is designed to provide clinical experience in hospitals. Emphasis is placed on respiratory care for critical patients. Advanced respiratory care topics such as airway care, mechanical ventilation, and positive and expiratory pressure are reviewed.

86.271 Advanced Life Support Systems I 4 Q.H.

(Prereq. 86.234, 86.225)

Designed to introduce students to selected techniques of advanced life support applied to the critically ill patient.

86.272 Advanced Life Support Systems II 4 Q.H.

(Prereq. 86.271)

Continuation of Advanced Life Support Systems I.

86.274 Advanced Clinical Physiology 4 Q.H.

(Prereq. 73.204 and permission of instructor)

This lecture course is designed to enrich the respiratory therapy students' program by providing them with an opportunity for an in-depth exposure to medical physiology, based on the concept of the homeostatic state and its application to the clinical setting.

86.276 Neonatal Respiratory Care 4 Q.H.

(Prereq. 86.272, 86.274)

The course is designed to provide the student with an understanding of the methods and techniques of respiratory therapy for neonatal patients. Emphasis is placed on mechanical ventilation, newborn care, and the respiratory distress syndrome.

86.277 Directed Independent Study I 2 Q.H.

(Prereq. 86.287 concurrently)

This is a course of directed study in a student's major wherein in-depth investigation of a special interest area is undertaken.

86.278 Respiratory Care for the Neonatal Patient 4 Q.H.

(Prereq. 86.272, 86.274)

The course is designed to provide the student with an opportunity to understand the methods and techniques of respirator therapy for neonatal patients. Emphasis is placed on mechanical ventilation, newborn care, and the respiratory distress syndrome.

86.281 Introduction to Perinatal/Pediatric Respiratory Care 2 Q.H.

(Prereq. 86.224)

This course is designed to provide the student with the opportunity to acquire knowledge and understanding of human cardiopulmonary development from the time of conception through childhood years. Normal as well as abnormal manifestations of pregnancy, labor, and the process of delivering are also emphasized. Methods and techniques of assessment and delivery of respiratory care will relate to the pediatric patient's pathophysiology of cardiopulmonary disease.

86.287 Practicum in Critical Care 4 Q.H.

(Prereq. 86.272, 86.274, 86.278 concurrently)

The course is designed to allow the student to select an area of emphasis from among the following: intensive care units, neonatal-pediatrics, or extracorporeal membrane oxygenation. During the practicum courses students are provided with an opportunity to work in their specialty areas.

86.288 Practicum in Critical Care 4 Q.H.

(Prereq. 86.287)

This is a continuation of 86.287.

86.290 Rehabilitation of Children with Respiratory Disorders 4 Q.H.

The course applies a broad definition of rehabilitation to the life situations of children with respiratory disorders. Students will have the opportunity to learn specific skills that address the recognition and management of acute and chronic problems. Model systems of psychosocial as well as physical support based on these skills will be developed. The course is open to students in health or human service disciplines who have had clinical or field experience.

86.291 Practicum in Pediatric Pulmonary Rehabilitation 1 Q.H.

(Prereq. 86.290 or permission of instructor; enrollment limited)

Counselorship under medical direction at a one-week summer camp for children with severe pulmonary disorders. Students will apply skills acquired in 86.290 in residential camp situation and respond to medical or psychosocial problems in a manner consistent with current methods in his/her discipline. Group and individual discussions with the instructor will clarify insights and experiences. Daily case reports will document the learning process.

Physician Assistants

86.290 Medical Ethics 3 Q.H.

This course is designed to help familiarize students with various philosophical perspectives in medical ethics, including historical, classical, ethical, and contemporary philosophies regarding issues such as abortion truth telling, genetic control, and the allocation of scarce medical resources. Euthanasia and paternalism are among topics discussed during the course.

86.120 Roles, Rules, and Resources for Physician Assistants 2 Q.H.

This course is designed to help students who wish to understand the role of physician assistants, including the manner in which they interact with other health professionals, as well as the way in which their role is perceived by others. This course is also organized to help the student gain an understanding of the law as it relates to physician assistants' actions and to

health care in general. Common resources are also discussed.

86.121 Patient Education and Counseling 2 Q.H.

(Prereq. 86.135)

The purpose of this course is to provide students an opportunity to acquire the knowledge necessary for application of the teaching-learning process. Lectures demonstrate how to evaluate patients' needs and readiness to learn; identify motivational factors used in teaching patients; and develop common teaching techniques for issues such as childhood operations, chronic disease management, ostomies, and mastectomies.

86.122 Medical Care and Current Social Problems 2 Q.H.

This course covers the principal components of the health care delivery system, with emphasis on services, organization, and funding. Selected social problems are used to demonstrate the operation of the medical care system.

86.123 Principles and Concepts of**Emergency Medicine****3 Q.H.**

(Prereq. 86.236, 86.237)

This course offers an introduction to the principles of life-support techniques. Emphasis is placed on the initial management of acute medical and traumatic conditions in hospital and pre-hospital situations. Students are instructed in basic cardiopulmonary resuscitation techniques.

86.124 Clinical Nutrition**3 Q.H.**

The course covers the physiological function of essential nutrients; the need for individual nutrients and their food sources; food fads and food additives; the role of nutrition in heart disease, diabetes, common gastrointestinal disorders, obesity, and hypertension.

86.125 Human Anatomy**2 Q.H.**

This course covers the basic structure of the human body, with emphasis on the gastrointestinal, cardiovascular, respiratory, and musculoskeletal systems. The didactic sessions are complemented by mammalian dissection.

86.134 Essentials of Physical Diagnosis**5 Q.H.**

Course content includes techniques of obtaining and presenting an accurate history; performing a competent and thorough physical examination; and synthesizing the results of the history, physical, and laboratory findings to arrive at an accurate evaluation of the patient. Discussion, demonstrations, and patient workups are used to assist students in building these skills.

86.135 Principles of Interviewing**2 Q.H.**

Various methods of interviewing patients are covered. Emphasis is placed on establishing a relationship and understanding the effects of cultural background and psychosocial problems on the patient's response to illness, goal setting, and personality types.

86.139 Physiological Basis of Disease**2 Q.H.**

(Prereq. 86.239)

Class sessions focus on the anatomy and physiology of the neurological system; understanding the functioning of nervous pathways, sensations, and motor neurons; disorders and disease states; and treatment and management.

86.142 Principles of Pediatrics**3 Q.H.**

(Prereq. 86.134)

The course offers a study of both the physiological and psychological fundamentals of child development, including immunizations and their administration, indication, or contraindication. Emphasis is on the major common pediatric illnesses, their signs, symptoms, and treatment regimens; various types of medications used in pediatrics, their indication and dosage in relation to specific disorders; and the management of pediatric emergencies such as cardiac arrest, anaphylaxis, convulsions, coma, and high fevers.

86.143 Principles and Concepts of Surgical**Intervention in Disease Processes****3 Q.H.**

(Prereq. 86.236, 86.237)

Students are introduced to major surgical conditions, with emphasis on indications for surgical intervention and pre- and post-operative management.

86.145 Principles of Psychiatry**3 Q.H.**

This course offers students the opportunity to learn to understand and work with patients and families exhibiting psychiatric problems. Topics include psychological growth and development, the effect of social milieu on behavior, the psychological bases of drug and alcohol abuse, and the dynamics of emotional psychosomatic problems.

86.146 Basic Diagnostic Radiology**2 Q.H.**

The course provides an introduction to the underlying principles, use, and interpretation of radiographs pertinent to primary care medicine.

86.147 Principles of Obstetrics and**Gynecology****3 Q.H.**

(Prereq. 86.134)

This course focuses on the anatomy and physiology of human reproduction: normal conception, pregnancy, and delivery; problems in conception; the management of pre- and post-natal periods; and the care and resuscitation of the newborn. Emphasis is on the causes, signs, and treatment of common gynecological problems, including the significance of early cancer detection. Different methods of contraception, the effectiveness of each method, and the contraindication, if any, are covered. The course also covers the medical indications for abortion and the appropriateness of the various methods of pregnancy termination.

86.148 Survey of Rehabilitation Medicine**2 Q.H.**

(Prereq. 86.236, 86.237, 86.238)

This course provides students an opportunity to learn techniques of effective planning and decision making for patients with multiple chronic problems. The purposes, techniques, and potential of rehabilitation medicine are also discussed.

86.149 Fundamentals of**Electrocardiography****2 Q.H.**

(Prereq. 86.236, 86.237)

Basic principles of electrophysiology and its application to electrocardiographic tracing are discussed. Instruction focuses on recognizing arrhythmias, rate and axis determinations, conduction abnormalities, characteristic changes seen in myocardial infarction and ischemia, as well as drug and metabolic effects manifested on the electrocardiogram. Students have the opportunity to gain experience in implementing their knowledge in interpretation of EKGs through slide presentations and teaching-file EKGs. Although not part of this course,

Instruction is also offered in the technique of taking a twelve-lead electrocardiogram.

86.172 Medical Therapeutics 3 Q.H.
(Prereq. 73.114, 86.236, 86.237, 86.238)

A case-study format involving students in planning the management of common-disease states is used to help students understand the clinical use of common therapeutic agents.

86.236 Pathophysiology and Medicine 2 Q.H.
This course offers a systems approach to the principles of disease processes in people. Topics include physiology, pathophysiology, the natural history of disease, diagnostic procedure, and therapeutic measures. Pathophysiology, hematology, gastroenterology, and pulmonary problems are usually covered in this portion of the course.

86.237 Pathophysiology and Medicine 2 Q.H.
(Prereq. 86.236, 86.134)

Continuation of course from previous quarter. Prerequisite: 86.236 (see Quarter I). Cardiology, immunology, rheumatology, and renal problems are usually covered in this portion of the course.

86.238 Pathophysiology and Medicine 2 Q.H.
(Prereq. 86.236, 86.237, 86.134)

Continuation of course from previous quarter. Dermatology, oncology, infectious disease, and endocrine problems are usually covered in this portion of the course.

86.239 Medical Physiology 6 Q.H.

This course introduces a systematic approach to human physiology, offering in-depth study of gastrointestinal function, respiratory mechanics, endocrine function, cardiovascular dynamics, and renal and electrolyte functions.

86.241 Applied Study In Emergency Medicine 4 Q.H.

During this rotation, the student has the opportunity to become familiar with the problems encountered in an emergency room. The student is responsible for taking medical histories and performing physical examinations on acute as well as non-emergency patients and presenting these to the medical preceptor. When appropriate, the necessary diagnostic and therapeutic measures are taken. Through didactic sessions at the clinical site, as well as clinical training, the student may also be exposed to the emergency management and treatment of conditions such as trauma, shock, burns, asthma, poisoning, allergic reactions, seizures, and respiratory failure.

86.242 Applied Study In Medicine 4 Q.H.

Rotating through hospitals, clinics, and private office settings, the student is given the opportunity to take and record histories and perform physical examinations. In attending medical rounds and conferences, performing diagnostic procedures, presenting case write-ups, recording progress notes, and working under the supervision of a doctor of medicine,

the student has the opportunity to become versed in the assessment and management of a variety of medical problems seen in primary care. Emphasis is placed on the skills of: 1) collecting, assessing, and presenting patient data for physician review; 2) ordering appropriate laboratory and diagnostic studies; 3) counseling patients in therapeutic procedures; and 4) helping to coordinate the contributions of other health professionals in the management of the patient.

86.243 Applied Study In Pediatrics 4 Q.H.

During the pediatric rotation, the student has the opportunity to become familiar with outpatient pediatric problems through training in clinics and private pediatric offices. Emphasis during this training is on caring for the child from birth through adolescence. Students are given the opportunity to take histories and perform pediatric physical examinations. Diagnosis and management of common childhood illnesses and evaluation of the variations of growth and development are also stressed. Students have the opportunity to develop skills with which to counsel parents on immunizations, child visits, parameters of growth and development, common psychosocial problems, nutrition, and accident and poisoning prevention. Students may also have the chance to learn how to administer immunizations and, when possible, to do audio and visual screening.

86.244 Applied Study In Psychiatry 4 Q.H.

The student is offered exposure to a wide variety of psychiatric problems. Clinical settings include wards, clinics, multiservice centers, and nursing homes. Students are expected to perform mental status exams and to do cognitive testing. Emphasis is on recognizing various types of psychiatric problems that require referral to a specialist and managing those problems that can be handled by the non-specialist. Rotations may also assist students in furthering their understanding of effective patient interactions and the psychiatric components of health, disease, and disability.

86.245 Applied Study In Obstetrics and Gynecology 4 Q.H.

The student on rotation has the opportunity to become involved with obstetric and gynecological services provided by teaching hospitals in the Boston area. The emphasis in obstetrics is on pre- and post-natal care, monitoring a woman in labor, assisting in deliveries, and developing the skill necessary to deliver a child in an emergency situation. Students have the opportunity to take obstetrical histories and perform obstetrical examinations. While rotating through gynecology, the student is expected to learn how to assess and manage a variety of common gynecological problems and to counsel patients on family planning.

86.246 Applied Study in Primary Care 4 Q.H.
Students on primary care rotations are offered exposure to aspects of general medical and family practice with emphasis placed on personalized care of well and sick patients. Patient education, counseling, and integration of community services, as well as medical diagnosis and management, are considered a major part of this rotation.

86.247 Cancer Prevention 3 Q.H.
(Prereq. 86.135, 86.134, 86.236, 86.237)
Principles of primary and secondary prevention of cancer are presented. Included in the course

is information on biostatistics, cancer as a public health problem, and cancer epidemiology.

86.248 Principles of Orthopedics 3 Q.H.
(Prereq. 86.146)

Students have the opportunity to learn about common orthopedic problems, including those of the hand, knee, shoulder, and back. Special problems of acute trauma and the management of uncomplicated orthopedic cases are examined. Instruction also focuses on the techniques of completing an adequate patient history and physical examination of the orthopedic patient.

Cooperative Education

90.113 Career Development for Criminal Justice 4 Q.H.
(Prereq. Upperclass Criminal Justice majors only)

Activity-oriented seminars emphasize career planning and job-search techniques. Participants are expected to research professional level jobs in the criminal justice field, examine lifestyles, prepare or revise their résumés, develop interviewing skills, and set personal, educational, and career goals.

90.114 Life/Career Planning 4 Q.H.
(Prereq. Juniors and seniors only)

Highly participatory classes, open to juniors and seniors in any of the Basic Colleges, focus on career exploration, self-assessment, job-search techniques, and networking. Students are required to prepare a professional resume, participate in videotaped mock interviews, research careers, and investigate graduate and professional schools.

90.130 Career Advisement for Criminal Justice I 1 Q.H.
(Prereq. Criminal Justice freshmen only)

The first in a three-course sequence, taught by the students' freshman adviser, aims to assist students in adjusting to college life, developing college survival skills, and becoming familiar with the broad range of careers in the field of criminal justice. Classes are augmented with individual meetings with the instructor/adviser.

90.131 Career Advisement for Criminal Justice II 1 Q.H.
(Prereq. 90.130 or permission of freshman adviser)

Students are introduced to cooperative education and its implications for career planning. Work and personal values, interests, skills, and lifestyles are examined in terms of their relation to career options within the field of criminal justice.

90.132 Career Advisement for Criminal Justice III 1 Q.H.
(Prereq. 90.131)

The final course in the three-course sequence is devoted to the preparation of a personal resume, an introduction to interviewing techniques, and the setting of short-term educational and vocational goals. Students are required to research criminal justice jobs using the career exploration system.

90.180 Career Decision Making 4 Q.H.
(Prereq. Sophomores in any major or permission of instructor)

A life/career planning course designed to meet the needs and concerns of students who may be undecided or uncertain about their academic major or career direction. Activity-oriented classes and workshops address the needs of the group, as well as individual participants, and emphasize self-assessment, career exploration, decision making, and goal setting.

90.251 Placement Techniques 1 Q.H.
Career selection and development are discussed concurrently with resume preparation, interviewing techniques, and effective written communication to facilitate the planning and implementation of a professional career program.

90.253 Professional Development for Teachers 1 Q.H.

The course offers an examination of the following topics: analysis of the job market for teachers, role of the Education Placement Office, alternative careers for education graduates, graduate study, and certification procedures. A discussion of resume preparation and interviewing techniques is also included.

90.256 Career Management in Physical Therapy 1 Q.H.
Career management in physical therapy is examined in view of professional development

and career opportunities; other discussions include resume preparation, communications, and the interview process.

90.260 Nursing Career Management 4 Q.H.

The course provides the opportunity to explore traditional and non-traditional nursing careers and education, the world of work, personal and work values, lifestyle, and career management techniques including skills identification, resume writing, sources of career information,

evaluating an employer, assertiveness, and selected current issues relevant to nursing careers.

90.265 Professional Development for Civil Engineers 4 Q.H.

The course is designed to foster self-assessment skills and to enhance personal and professional growth, as well as to provide a forum for civil engineering students to exchange views on current professional issues and topics.

Military Science

91.150 Leadership Lab I 0 Q.H.

Introduction of first-year ROTC students to the basic tenets of discipline and regimentation of the U.S. Army. Includes the basics of proper wear of military clothing, proper rendering of military courtesies, military customs and traditions, individual and group drill and ceremonies, manual of arms for the M16A1 rifle, and physical fitness training. Attendance required for all first-year cadets enrolled in an ROTC course.

91.151 The Army Structure 1.5 Q.H.

An introduction to the Army's force structure and its relation to the other military services at Defense Department level. The course analyzes the Army's major command groups down to division level to include mission, location, and branch requirements. The course defines each Army branch (infantry, armor, field artillery, etc.) to include the branch mission and nature of the primary duty associated with an officer's assignment to a particular branch.

91.152 American Military Heritage 1.5 Q.H.

Course traces the evolution of the military profession and its attendant institutions. Emphasis is on the development of professionalism in the officer corps. The course is designed to enable the student to explore the implications of service as a professional Army officer in today's Army.

91.153 Tactical Simulations 1.5 Q.H.

Mission, organization, and composition of the basic infantry rifle squad. Includes basic combat formations, movement techniques, unit capabilities, and planning considerations. Uses the Dunn-Kempf wargame in a series of practical exercises that apply classroom instruction through use of a boardgame and miniatures simulating the modern battlefield.

91.160 Leadership Lab II 0 Q.H.

Introduction and hands-on training for the second-year ROTC cadets. Includes required basic military skills, including nuclear, biological, and chemical protective training; selected weapons training; use of U.S. Army communications equipment; land navigation;

orienteering; rappelling; and limited military vehicle maintenance training. Attendance required for all second-year ROTC cadets enrolled in an ROTC course.

91.161 Marksmanship 1 Q.H.

Instruction and practical application in basic rifle marksmanship techniques, safety, and range operation. The course will cover sanctioning bodies rules for small-bore rifle competition firing, preparation for competition firing, preparation for competition, and intra-class competition.

91.162 Contemporary Military Doctrine 1.5 Q.H.

The historical development of U.S., Soviet, and other selected military philosophies and resultant force development and employment are presented as a basis for the examination of the organization, weapons, equipment, doctrine, tactics, and capabilities of combat, combat support, and combat service support units.

91.163 Advance Tactical Simulations 1.5 Q.H.

Application of tactics at battalion through division level using low-resolution, map-manuever war games such as "Pegasus" and "First Battle In European Settings." The planning and combat phases will include all considerations normally associated with conventional combat, e.g., logistics, personnel, administration, transportation. 91.153, Tactical Simulations, prerequisite.

91.164 Insurgency Since 1945 1.5 Q.H.

A study of the nature of insurgency to include the leadership of both the recognized government and the dissident force, the nature of the cause of insurgency, and an analysis of selected insurgencies using case studies. Two case studies will be selected from the following: Malaya, Philippines, Algeria, and Venezuela.

91.165 Great Battles of Military History 1.5 Q.H.

This course analyzes some of the great battles in military history. Methods of analysis include investigation of military theory and doctrine, generalship, strategy, tactics, logistic administration, technology, and the socio-political-economic factors that resulted in the battles' outcomes.

91.250 Leadership Lab III**0 Q.H.**

Advanced military skills training, especially physical readiness and leadership practical application, preparing third-year ROTC cadets for attendance at Advanced Leadership Lab V (ROTC 6-week summer camp), Fort Bragg, NC. Attendance required for all third-year ROTC cadets enrolled in an ROTC course.

91.251 Land Navigation**2 Q.H.**

Identify map symbols to natural and manmade features; identify/use military grid reference system; measure straight line and read distance on a map; measure and plot an azimuth; convert azimuth from grid to magnetic grid; grid; locate an unknown point using polar coordinates; locate an unknown point using intersection; locate an unknown point using resection; locate an unknown point using modified resection; determine the evaluation of a specific point on the map. Inspect a compass for accuracy; navigate from one point on the ground to another.

91.252 Methods of Instruction**2 Q.H.**

This course provides an introduction to the concept of training management, including the fundamentals of teaching, principles of learning, and the establishment of training objectives. In addition, students will demonstrate proper instructional techniques and lesson plan preparation and conduct classroom instruction. For the most part, specific emphasis is given to hands-on student participation and performance-oriented training.

91.253 Military Teams**2 Q.H.**

Introduction to the fundamentals of offensive and defensive combat at the squad and platoon levels, continuing on through combined-arms tactics at the company level. Includes unit organizations and capabilities, tactical planning, combat orders; utilizes practical exercises placing the student in leadership roles in simulated tactical environments.

91.254 Advanced Leadership Clinic**2 Q.H.**

Classroom, programmed instruction, and practical exercises (e.g., land navigation, physical conditioning, weapons familiarization, and leadership) designed to prepare cadets for maximum individual performance at the 6-week ROTC advanced camp, Fort Devens, MA. This course is required for all cadets attending advanced summer camp at Ft. Bragg, NC.

91.260 Leadership Lab IV**0 Q.H.**

Practical application of previously learned skills, techniques, education, and experience by fourth-year ROTC cadets by assisting ROTC cadre in the conduct of 91.150, 91.160, and 91.250. Cadets prepare and present instruction, manage constrained resources, and supervise subordinates. Evaluation is based on active-duty Army criteria. Attendance required for all fourth-year ROTC cadets enrolled in an ROTC course.

91.261 Organizational Dynamics**2 Q.H.**

This course will examine the theory, methods, and principles for understanding and motivating human behavior in organizations. The principles and dynamics of leadership will be emphasized and directed toward the development of leadership styles. Practical applications will be made through the use of case studies and group processes.

91.262 Military Law**2 Q.H.**

This course considers in detail the issues and responsibilities imposed by law on commanders and staff officers in two broad areas: the military criminal justice system and military administrative law. Practical guidance for identifying and resolving issues of law is stressed. In the criminal law area, the course presents in-depth analysis of the responsibilities and duties of officers and non-commissioned officers concerning the military justice system. Administrative law subjects focus on the legal basis for command and on administrative due process; judicial review of military activities and other topical issues in this area of law.

91.263 The Military as a Profession**2 Q.H.**

This seminar course provides the advanced ROTC student with the opportunity to examine the military as a profession and to discuss military professional ethics. The course will address the characteristics, uniqueness, and roles of the profession of arms and responsibilities of the professional soldier to the Army and the nation. Students will develop an understanding of the need for ethical conduct and an awareness and sensitivity to ethical issues. The course will present case studies on current issues and discuss problems typically encountered by new officers.

91.299 Advanced Leadership Lab V**6 Q.H.**

External leadership lab conducted at Fort Bragg, North Carolina, during the summer quarter. Intensive 6-week course includes application of leadership principles in positions at varying levels of responsibility. Supplemental instruction includes: physical conditioning, counseling, senior-subordinate relations, tactical doctrine, international laws of land warfare, and approaches to problem solving. Course attended by students from 123 colleges and universities from Maine to Florida. All expenses are borne by the U.S. Government, including an approximate \$500 stipend.

91.201 The Air Force Today**1 Q.H.**

Examines the role of the U.S. Air Force in the contemporary world. Topics include background, mission, and organization of Air Force and functions of U.S. strategic forces. Also, emphasis is placed on development of written communicative skills.

- 91.202 Leadership Laboratory I 1 Q.H.**
Introduction to the customs, traditions, and courtesies of the Air Force through guest speakers, seminars, and a field trip to an Air Force base.
- 91.203 Air Force Today 1 Q.H.**
Continues study of the contemporary Air Force by examining general purpose forces, aerospace support forces, and the total force structure.
- 91.204 Leadership Laboratory II 1 Q.H.**
Continues 91.202 with emphasis on the role and responsibilities of an Air Force junior officer.
- 91.205 The Development of Air Power 1 Q.H.**
History of the development of air power from balloon experiments up through World War II. Emphasis on interrelation of technology, doctrine, historical events. Student participation and presentations are emphasized to enhance verbal communicative skills.
- 91.206 Leadership Laboratory III 1 Q.H.**
Emphasizes development of techniques used to direct and inform. Students are assigned leadership and management positions in the 91.202 programs described above.
- 91.207 The Development of Air Power 1 Q.H.**
History of airpower since 1946, with emphasis on the U.S. Air Force. Includes the role of air forces in conflicts and the effect of space-age technology on air power. Also an examination of the employment of U.S. air power in peaceful ways.
- 91.208 Leadership Laboratory IV 1 Q.H.**
Continues 91.206. Adds a special program in preparation for field training.
- 91.209 The Military in American Society 4 Q.H.**
Study of the military's role as an institution in a democratic society. Topics: civil-military interaction and the military as a profession. Emphasis on developing communicative skills through student presentations.
- 91.210 Leadership Laboratory V 1 Q.H.**
Exercise of management functions in planning, supervising, and directing cadet group activities.

Opportunity to acquire proficiency in military leadership skills.

- 91.211 U.S. National Security 4 Q.H.**
Study of the role of the military in maintaining the security of the United States. Examines the international environment, the background of defense policy, strategy, and forms of conflict. Addresses specific issues, including weapons acquisition, arms control, nuclear deterrence, and the national military decision-making process.
- 91.212 Leadership Laboratory VI 1 Q.H.**
Continues 91.210. Students prepare themselves for professional duties.
- 91.213 Management and Leadership I 4 Q.H.**
Management and leadership from the point of view of the Air Force junior officer. The individual motivational and behavioral processes, leadership, communication, and group dynamics are covered to provide a foundation for the development of the junior officer's professional skills as an Air Force officer.
- 91.214 Leadership Laboratory VII 1 Q.H.**
Supervisory practice and exercise of leadership functions in controlling and directing activities of the cadet group. Development of leadership potential in a practical, supervised training laboratory.
- 91.215 Management and Leadership II 4 Q.H.**
Continues 91.213 with special emphasis on the basic managerial processes involving decision making, utilization of analytical aid in planning, organizing, and controlling in a changing environment. Organizational and personal values, management of forces in change, organizational power, politics, and managerial strategy and tactics are discussed within the context of the military organization. Actual Air Force cases are used to enhance the learning and communication processes.
- 91.216 Leadership Laboratory VIII 1 Q.H.**
Continues 91.214. Emphasis on supervisory and leadership skills. Emphasis on advantages of an Air Force career.

Criminal Justice

- 92.104 Administration of Criminal Justice 4 Q.H.**
This course surveys the contemporary criminal justice system from the initial contact with the offender through prosecution, disposition, incarceration, and release to the community. Emphasis is placed on major systems of social control: police, corrections, juvenile justice, mental health systems, and their policies and practices relative to the offender. A balance is maintained in providing legal, empirical, and sociological materials.

- 92.107 Human Factors in Policing 4 Q.H.**
(Prereq. 92.115)
This course focuses on the theory and practice of human relations and conflict management necessary for effective policing. It is recommended for those with a career interest in policing.
- 92.108 Survey of Correctional Systems 4 Q.H.**
(Prereq. 92.137)
The course offers an introduction to penology and corrections, exploring the public reaction to convicted offenders historically, while concentrating on issues and programs of contemporary corrections.

92.110 Police-Community Relations 4 Q.H.

(Prereq. 92.131, 92.115, and junior or senior status)

The course covers police-public contact; uses of the communications media in projecting the police image; responsibilities of police in dealing effectively with minority groups, civil rights, civil disorder, and public protection. An exploration of the role and function of the police in intergroup relations is also included.

92.114 Criminal Justice Research 4 Q.H.

(Prereq. 10.110 or equiv., and middler, junior, or senior standing)

This is a survey course of methods for basic and applied research in criminal justice, combining statistics and research methods. While providing minimal research literacy, this course concentrates on research application by stressing discussion of the general role of research in the discipline and specific contributions advanced by studies in the literature.

92.115 Police Operations 4 Q.H.

(Prereq. 92.131)

The course offers a general survey of police operational procedures, including patrol, traffic, interrogations, and report writing. Role playing is used extensively to demonstrate interviewing methods.

92.128 Introduction to Private Security 4 Q.H.

The course examines the organization and administration of security and loss prevention programs in industry, business, and government. Emphasis is placed on the protection of assets, personnel, and facilities, and focuses on the relations between security organizations and government agencies.

92.129 Criminal Justice Planning 4 Q.H.

(Prereq. 91.157; a statistics course; and middler, junior, or senior standing)

The course examines criminal justice planning theory and methods. Emphasis is on the need for criminal justice planning and the tools used in the planning process. Students in small groups are expected to prepare a sample criminal justice plan during the term.

92.130 Criminalistics I: Criminal Investigation 4 Q.H.

The course focuses on criminal investigation dealing with areas of investigation, case preparation, and applied physiology.

92.131 Law Enforcement Administration and Management 4 Q.H.

The course covers the principles of police organization, administration, and management, including staff and line functions, chain of command, span of control, selection of personnel, and promotional systems. Consideration is also given to special problems such as strikes,

natural and atomic disasters, narcotic traffic, and vice control.

92.134 Constitutional Problems 4 Q.H.

(Prereq. 92.141)

This is a required course focusing on a historical evaluation of the Fourteenth Amendment and its use in making rights prescribed under the Bill of Rights applicable to the individual states. Also detailed in the course are the inherent problems of the Fifth and Sixth Amendments, including the effect of their implications on such matters as police practices, illegal search and seizure, and right to counsel. Students are expected to be familiar with basic concepts as well as changing interpretations so that they can cite cases that may stand as precedents for conclusions they draw.

92.137 Criminology 4 Q.H.

The course covers patterns and evolution of criminal behavior, the social forces involved, and development of the individual criminal. Administration of criminal justice: law, courts, police, prisons.

92.139 Theories in Penology 4 Q.H.

(Prereq. 21.100 and 92.137)

The course offers a philosophical approach to the development of punishment in the United States, as examined in a historical context. Issues of justice and morality are considered as they are manifested in contemporary penal structure. Readings include selections from eighteenth-, nineteenth-, and twentieth-century novelists, philosophers, and criminologists.

92.140 Criminalistics III: Arson and Fire Investigation 4 Q.H.

A course in the examination and behavior of fire. Deals with fire-related phenomena such as convection, radiation, contact, and ignition and includes consideration of arson, explosions, asphyxiation, and combustibility. The course will also cover fireproofing agents such as plastics, textiles, building materials, and the chemistry of the halogens. Finally, some time is given to areas of fire experimentation and the potential for more sophisticated inquiry.

92.141 Criminal Law 4 Q.H.

The course deals with the area of criminal responsibility, some of its limitations, and certain modifications substantially affecting it. The course requires an ability to express in writing both the knowledge of a particular concept and the ability to identify it in a complex fact pattern and discuss its implications and ramifications.

92.142. Survey of Criminal Evidence 4 Q.H.

(Prereq. 92.141, 92.134)

This survey course focuses upon the fundamentals of criminal trial procedure and the rules

of evidence as they apply to the trial of a criminal case. Students are required to read and brief criminal court cases.

92.143 Criminalistics II: Forensic Laboratory

4 Q.H.*

(Prereq. 92.130 and permission of instructor)

The course provides a survey of the elements of microscopy, spectroscopy, and basic chemistry as they apply to the study of firearms, hair, fibers, blood, paint, tools, glass, documents, laundry marks, poisons, and other materials that comprise physical evidence.

92.147 The Administration of Juvenile Justice

4 Q.H.

(Prereq. 21.100, 92.137)

Course work examines the juvenile court, its philosophy, procedure, and personnel. Focus is on the discretionary processes by which juveniles are labeled delinquent, dependent, and neglected. The roles played by police, prosecution, defense, bench, and social service workers are considered. Field visits are arranged.

92.148 Probation and Parole

4 Q.H.

(Prereq. 92.108)

The course examines the nature and problems of correctional field service, both adult and juvenile.

92.149 Alternatives to Incarceration

4 Q.H.

(Prereq. 92.131 and middler, junior, or senior standing)

This course examines the concept of criminal and juvenile justice in terms of the alternatives to and the consequences of incarceration in total institutions such as jails, prisons, and secure detention homes. It examines current alternatives in light of the history, philosophy, and reality of institutionalization and the theories of punishment.

92.155 Seminar in Law Enforcement

4 Q.H.

(Prereq. 92.131, 92.115, and junior or senior standing)

The course provides an opportunity for free discussion about the numerous problems facing the law enforcement officer. Periodic oral and written reports are required. Guest lecturers are invited to participate in and lead discussion sessions. An effort is made to have students formulate their own philosophy of law enforcement prior to graduation.

92.156 Seminar in Law and Criminal Justice

4 Q.H.

(Prereq. 92.141, 92.134, and junior or senior standing)

Specific topic to be announced.

92.157 Research Methods in Criminal Justice

4 Q.H.

(Prereq. A statistics course and middler, junior, or senior standing)

The course focuses on development of research design of the kind most useful to criminal justice

problems; understanding some of the most important issues and problems facing researchers in the field; use of various data collection methods, including observation, interviewing, questionnaire construction, and scales for survey analysis; validity and reliability; computer application in criminal justice.

92.167 Correctional Institutions

4 Q.H.

(Prereq. 92.108)

The course offers an analysis of the organization and administration of correctional institutions.

92.168 Crime and Social Defense

4 Q.H.

(Prereq. 92.104, 21.100, or equiv.)

The course examines the problems of crime and its control from a comparative perspective. Countries such as the Soviet Union, China, France, East and West Germany, Great Britain, Holland, Finland, and Sweden are analyzed in terms of incidence and type of deviance and crime, as well as in terms of their approach to social control and the prevention of crime. Points of divergence between these countries and the United States will be examined, with regard to their perceived causes of crime and their differing approaches to rehabilitation and crime prevention.

92.170 Women and the Criminal Justice System

4 Q.H.

(Prereq. Middler, junior, or senior standing)

This course is intended to introduce students to issues relating to roles taken by women involved with the criminal justice system and to the system's various responses to women in these roles. Specific focus will be directed toward women as victims of crime, as offenders, and as practitioners.

92.181 Police Discretion

4 Q.H.

(Prereq. Middler, junior, or senior standing)

This course examines the nature and impact of discretion as it relates to police decision making. Attention is given to various forms of police discretion and ways in which it can be structured, confined, and checked. Students have the opportunity to examine and learn to analyze sample police department policies and study different formal and informal methods of developing policies. Students also study the relation of discretion to controlling police behavior and police corruption.

92.191, 92.192, 92.193, 92.194 Directed Study

each 4 Q.H.

92.209 The Female Offender

4 Q.H.

(Prereq. 21.100 and 92.137)

The course addresses itself to the female at various stages in the criminal justice system, from commission of a crime to parole. Both the juvenile and adult offender are studied. The thrust of the course is a critical analysis of existing theory and research on the female offender, with emphasis on the socialization,

roles, and social participation of society at large. The male offender is also considered at each level for purposes of comparison.

92.210 Topics in History of Criminal Justice

4 Q.H.

The course provides a historic survey of the principles of criminal justice in the ancient and medieval periods, with emphasis upon the impact of religion and philosophy.

92.211 Topics in History of Criminal Justice

4 Q.H.

A continuation of the historic survey with an examination of the effects of the Renaissance and the Reformation, and the rise of nation states.

92.215 Stigma and Justice

4 Q.H.

(Prereq. Middled, junior, or senior standing)

Student introspection and articulation of ideas are encouraged and expected in this course, which examines the history, theory, and reality of social and legal problems faced by those who are stigmatized. The effect of stigmatization, and the possibility of reintegration of offenders, ex-offenders, mental patients, ex-mental patients, men and women "on the street," addicts, alcoholics, the physically ill or disfigured, dishonorably discharged veterans, etc., are analyzed in the course. The major focus is

directed toward an examination of the manner in which the criminal justice system stigmatizes its clientele and how, in turn, some people who are stigmatized by society are much more prone to being clients of criminal justice.

92.216 Evidence I

4 Q.H.

(Prereq. 92.141, 92.134)

The goal of this course is to provide students the opportunity to develop their understanding of the manner in which legal issues and disputes are resolved by trial. Study will focus on the manner in which the trial system works and the reasoning behind the rules governing its operation, including rules of evidence: the mechanics of the adversary system, relevancy, reliability, and rules of exclusion based upon policy considerations other than relevancy and reliability. Learning tools will include videotapes, mock trials, observation of actual court trials, lectures, take-home assignments, and exams.

92.217 Evidence II

4 Q.H.

(Prereq. 92.216)

This course continues with reliability and rules of exclusion, based upon policy considerations other than relevancy and reliability as set forth in Part I.

Interdisciplinary Courses

93.110 FORTRAN Programming

4 Q.H.

(Prereq. One year college math)

The course focuses on techniques for programming problems on any large computer. Emphasis is on general programming methods using the language of FORTRAN. A large number of example problems are presented in an effort to display the applicability of computers to a wide variety of professional activities. No prior computer experience is required.

93.111 Advanced FORTRAN Programming

4 Q.H.

(Prereq. 93.110)

Higher-level aspects of the FORTRAN language are considered. Topics covered include the use of software packages, the manipulation of large data arrays, processing of nonnumeric information, magnetic tape operations, and data-file management. An introduction to systems analysis is presented, with emphasis on Monte Carlo and queuing simulation techniques.

93.120 An Analysis of American Racism

4 Q.H.

This seminar in contemporary aspects of racism in America discusses the cycle by which racism in our institutions helps form our attitudes and

the manner in which our attitudes, in turn, shape our institutions. Emphasis is on the practical, day-to-day aspects of racism, rather than the theoretical and historical.

93.125 COBOL Programming I

4 Q.H.

This course covers fundamentals of computer programming in COBOL. Topics include elementary computer functioning, program organization, input/output operations, arithmetic and data-handling verbs, and program logic development through the use of flow charts. Storage and manipulation of large data files on magnetic tape are introduced. No prior computer experience is required.

93.126 COBOL Programming II

4 Q.H.

(Prereq. 93.125)

Higher-level aspects of the COBOL language are considered. Included are use of decision tables in developing program logic, improving program efficiency; error detection and minimization techniques; bulk data storage in magnetic tape and disc files; storing, merging, updating, sorting, and purging data files; generating reports.

93.130 Professional Practices: Individual and Social Dimensions**4 Q.H.**

The course explores the dimensions and dilemmas of freedom and responsibility confronting professional people practicing within limits set by socio-economic conditions, by clients, and by other professionals. Case histories are examined to illustrate the dilemmas professionals face, the choices that are typically made, and the consequences these have on the freedom of the practitioner and on personal and professional integrity.

93.131 Introduction to Women Studies: Image, Myth, and Reality**4 Q.H.**

This introductory course in the study of women in society encompasses the historical, political, economic, and social processes that have created both the image and the reality of women in contemporary society. An overview of the many different disciplinary approaches to the study of women.

93.156 Biochemistry**4 Q.H.**

(Prereq. 12.144, 12.145)

This introductory course in biochemistry deals with the structures, functions, and metabolism of amino acids, proteins, carbohydrates, lipids, and nucleic acids. Mechanisms of enzyme reactions, enzyme kinetics, vitamins, biological oxidation reduction reactions, and bioenergetics are discussed as well as various inborn errors of metabolism.

93.159 Introduction to Art, Drama, and Music**4 Q.H.**

An introduction to the basic formal language of music, drama, and the visual arts. The course focuses on such formal elements as space, time structure, color, and interval by showing how these formal elements are, in effect, the "language" of the arts, and how they render intelligible a given art form. Lectures, discussions, and visits to museums and performances.

93.160 American Musical Theatre**4 Q.H.**

This interdisciplinary course, offered by the departments of Drama and Music, traces the development of the American musical from *The Black Crook* to *A Chorus Line*. The role of musical theatre, both as entertainment and as serious art form, is considered through an examination of script, score, dance, and design. Works by Bernstein, Rodgers and Hammerstein, the Gershwins, Weill, Lerner and Loewe, and Cole Porter are studied.

93.165 Humanistic Themes In the Arts**4 Q.H.**

An examination of the way in which certain humanistic themes and topics have been interpreted through music, drama, and the visual arts. The themes included are: "The Arts and Identity" and "The Arts and A View of the World," with focus on such topics as "The Arts

as Social and Political Commentary." Lectures, discussions, and visits to museums and performances.

93.171 Introduction to Science I**4 Q.H.**

93.171 and 93.172 form a two-quarter sequence for nonscience majors, providing an interdisciplinary treatment of basic concepts of the natural sciences, such as energy, gravity, and the atom. The course will also examine the ways in which atoms combine to form the substances that comprise matter.

93.172 Introduction to Science II**4 Q.H.**

(Prereq. 93.171)

This course applies principles previously learned in 93.171 to selected topics in biology, chemistry, physics, and geology. The subjects actually covered depend on the interests of the instructor, and, to some extent, on those of the students.

93.175 Individual In Society**4 Q.H.**

This team-taught course, jointly offered by the departments of Philosophy and Religion, Drama and Speech, and Sociology, explores the dimensions and dilemmas of freedom and responsibility. The ways in which the self emerges and adapts itself in socially oriented communication processes (including verbal and nonverbal symbolic language) are discussed, especially as these relations exercise constraints on enlightened choice for both individuals and institutions.

93.176 Communication and Quality of Life**4 Q.H.**

This course offers students an opportunity to develop a meaning for the concept "quality of life" and to gain knowledge of subjective and objective methods for measuring and assessing that concept. Problems in professions that influence quality of life are then identified, explored, analyzed, and possible solutions evaluated.

93.180 Physical Biochemistry**4 Q.H.**

(Prereq. 18.136 or 93.151)

This course examines physiochemical principles as they apply to biological processes. Topics include chemical equilibria, reaction kinetics, basic thermodynamics, oxidation-reduction reactions, bioenergetics, macromolecules in solution, and transport. The approach is quantitative, and problem solving as a tool for learning is emphasized. Basic assumptions and limitations underlying principles are explained; for the most part, however, rigorous derivations are avoided. Applications to basic experimental techniques in biochemistry are made by way of relevant biochemical examples.

232/Alternative Freshman-Year Program

93.185 Molecular Biology

4 Q.H.

(Prereq. 18.136 or 93.151)

The course emphasizes experimental design and proof in macromolecular chemistry and genetics. Studies current theories of the detailed molecular mechanisms for the preservation, expression, and evolutionary development of biological information. Applications to general biological and health problems will be emphasized. A two-hour period each week will be devoted to problem solving, research "game playing," and model building.

93.190 Advanced Biochemistry Laboratory

4 Q.H.

(Prereq. 18.136 or 93.151)

This course offers an intense laboratory experience for advanced undergraduate and graduate students. Experiments will emphasize protein and nucleic acid chemistry.

93.204 Health Professions: Past, Present, and Future

4 Q.H.

This course focuses on social history of the modern health professions. The course explores long-range patterns in the organization and regulation of the health professions, beginning with the Middle Ages and emphasizing the Jacksonian period, industrialization, modern professional organizations, the growing role of the state, responses of the health professions, and the future of health care in the United States under various corporate-government schemes for reorganization and "accountability."

93.230 Field Experience in Human Services I

4 Q.H.

Human services students are required to fulfill two fieldwork placements during the last two years of their program. Placement consists of 150 hours on site and generally varies according to the student's interest. Examples of placement sites include community centers, nursing homes, vocational workshops, state and federal agencies for children, and recreational facilities. Experiences are supervised by University staff to maximize the students' learning opportunities.

93.231 Field Experience in Human Services II

4 Q.H.

(Prereq. 93.230 and senior standing)
Continuation of 93.230.

93.232 Senior Seminar in Human Services

4 Q.H.

This course is designed for seniors in human services. The course examines emerging roles and career options within the human services field. Study focuses on self-examination of attitudes and values affecting delivery of services; exploration of ethical issues and dilem-

mas relevant to human services, grantsmanship and funding issues; staff supervision and development within human services agencies; and refinement of group leadership skills.

93.XXX, 93.YYY, 93.ZZZ Interdisciplinary Honors Seminars

(each) 4 Q.H.

One seminar is scheduled for each of fall, winter, and spring terms. Course numbers and content vary from year to year, since seminars are selected competitively from among faculty applications to the Honors Committee. Seminars to be offered are announced in late May for the following school year. A list of seminars offered for the current year is available from the Honors Program Office. Freshmen, sophomores, and middlers who qualify for the Honors Program may enroll. Juniors and seniors are not eligible.

93.249 Honors Seminar: Survey of the Social Sciences

4 Q.H.

This course is designed to provide an introduction to important ideas and scholarship in the social sciences for honors students who have completed the freshman year. A two-week period will be devoted to each of the following disciplines: economics, sociology/anthropology, political science, history, and psychology. Topics covered will vary from year to year depending on the faculty team that teaches the course. Offered in the winter term.

93.250 Honors Seminar: Survey of the Natural Sciences

4 Q.H.

This course is designed to provide an introduction to important ideas and scholarship in the natural sciences for honors students who have completed the freshman year. A two-week period will be devoted to each of the following disciplines: chemistry, biology, earth science, mathematics, and physics. Topics covered will vary from year to year depending on the faculty team that teaches the course. Offered in the spring term.

93.251 Honors Seminar: Survey of the Humanities

4 Q.H.

This course is designed to provide an introduction to important ideas and scholarship in the humanities for honors students who have completed the freshman year. A two-week period will be devoted to each of the following disciplines: art, music, drama, literature, and philosophy. Topics covered will vary from year to year depending on the faculty team that teaches the course. Offered in the fall term.

Alternative Freshman-Year Program

The following courses will be offered in the Alternative Freshman-Year Program during the 1982-1983 academic year.

10.100 Mathematical Preliminaries I 4 Q.H.

A review of pre-college mathematics, primarily arithmetic. Topics covered include operations with numbers, fractions, decimals, percents, and graphs (pictographs, bar graphs, circle graphs, etc.), together with applications of these skills and concepts. The sequel of this course is 10.110.

10.110 Mathematical Preliminaries II 4 Q.H.

A survey of precollege algebra, including signed numbers, exponents, multiplication of polynomials, factoring, linear equations, graphing, and radicals. The course is intended for students whose background in pre-college algebra is weak.

10.118 College Mathematics for Business 4 Q.H.

Topics include sets, rectangular coordinates and graphs, functions and functional notation, linear and quadratic functions, exponential and logarithmic functions, systems of linear equations; summations, inequalities, permutations and combinations, elementary probability concepts, arithmetic and geometric progressions, simple and compound interest, annuities.

21.401 Principles of Sociology I 4 Q.H.

An introduction to basic concepts and theories relating to the study of humans as participants in group life. Socialization, culture, social structure, primary groups, family, social stratification, and population are emphasized.

21.402 Principles of Sociology II 4 Q.H.

(Prereq. 21.401)

A continuation of 21.401, Principles of Sociology I, with emphasis on critical analysis of American society with particular attention to problems of social, political, urban, and industrial change.

22.401 Introduction to Political Science I 4 Q.H.

A study of the basic political concepts and forces of organization from the classical Greeks to the modern nation-state. The Soviet Union and the United Kingdom are contrasted as contemporary illustrations of the institutional distinction between a totalitarian and a constitutional system.

22.402 Introduction to Political Science II 4 Q.H.

Consideration of the development of operational liberty in the United States and its constitutional underpinnings. Analysis of the national American political process and the conduct of recent American foreign relations.

23.309 History of Civilization A 4 Q.H.

The major ideas and institutions of civilization from ancient times to 1648.

23.310 History of Civilization B 4 Q.H.

(Prereq. 23.309)

A continuation of 23.309, covering the period since 1648.

30.400 Fundamentals of English I 4 Q.H.

An intensive introduction to the principles of effective expository writing; emphasis on description, paragraph construction, and organization; review of the conventions of English usage, punctuation, and syntax; essay assignments.

30.402 Fundamentals of English II 4 Q.H.

Intensive instruction in exposition, argument, and academic essay writing; instruction in the writing of a research paper; continued emphasis on the conventions of English usage, punctuation, and syntax; essay assignments.

39.601 Economics I 4 Q.H.

Topics include development of macroeconomic analysis; review of national income concepts; national income determination fluctuation and growth; role of the banking system and the Federal Reserve System; government expenditures and taxation; international trade; and balance of international payments.

49.499 Intensive Management and Organization 4 Q.H.

The course offers an introduction to the setting and general structure of American business, the characteristics of private enterprise, and the nature and challenge of capitalism and other forms of economic enterprise. The forms of business, the structure of organization, and the functions of management are discussed in the context of their influence on the various forms of business. Through lecture and class discussion the student is given an overview of the methodologies used in planning, organizing, directing, and controlling the functions of production, marketing, sales, pricing, and finance.

51.531 Integrated Language Skills Development I 2 Q.H.

This course strives to improve a student's reading comprehension and related study and language skills. The course devotes time, discussion, and considerable practice to meaning skills such as basic reading comprehension and interpretation, including work in critical reading and other interpretational acts (inferences, understanding imagery, and symbolic usage). Study skills, previewing, finding main ideas and details, outlining and summarizing, and classification are also covered. There is continuous interaction and integration of all the communications skills: reading, writing, listening, and speaking.

51.532 Integrated Language Skills Development II 2 Q.H.

(Prereq. 51.531)

A continuation of 51.531.

Academic Calendar 1982-1983

September 1982

6	Monday	LABOR DAY. University closed.
7-10	Tuesday-Friday	Final examinations for Basic Colleges.
13-21	Monday-Tuesday	Division B vacation.
16	Thursday	FALL COMMENCEMENT.
22	Wednesday	Beginning of 1982-1983 academic year. Upperclass registration for Divisions B and C. Boston and Burlington Campus freshmen complete their registration. No Basic College classes today. Start of Basic College classes.
23	Thursday	

October 1982

11	Monday	COLUMBUS DAY. University closed.
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November 1982

11	Thursday	VETERANS DAY. University closed.
25-28	Thursday-Sunday	THANKSGIVING DAY recess.

December 1982

13-17	Monday-Friday	Final examinations for Basic Colleges.
20-Jan 2, 1983	Monday-Sunday	CHRISTMAS vacation.

January 1983

1	Saturday	NEW YEAR'S DAY. University closed.
4	Monday	Freshman and upperclass registration, Divisions A and C. No Basic College classes today.
15	Saturday	MARTIN LUTHER KING, JR.'S BIRTHDAY. University closed.

February 1983

21	Monday	WASHINGTON'S BIRTHDAY. University closed.
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March 1983

21-25	Monday-Friday	Final examinations for Basic Colleges.
28-Apr. 2	Monday-Saturday	Vacation period for all students in all colleges and schools (Division A vacation).

April 1983

4	Monday	Registration for Division B and C students and Division A seniors. Registration for freshmen (Quarter Three) at Boston Campus and Burlington Campus, and for January freshmen (Quarter Two). Beginning of Spring Quarter. Beginning of Division B work period. No Basic College classes today. PATRIOTS' DAY. University closed.
18	Monday	

May 1983

30	Monday	MEMORIAL DAY. University closed.
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June 1983

13-17	Monday-Friday	Final examinations for Basic Colleges.
19	Sunday	COMMENCEMENT.
20-24	Monday-Friday	Division B vacation.
27	Monday	Registration for Divisions A and D and January freshmen (Quarter Three). Beginning of Summer Quarter. Beginning of Division B work quarter. No Basic College classes today.

July 1983

4	Monday	INDEPENDENCE DAY observed. University closed.
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September 1983

5	Monday	LABOR Day. University closed.
6-9	Tuesday-Friday	Final examinations for Basic Colleges.
12-23	Monday-Friday	Division A vacation.
15	Thursday	FALL COMMENCEMENT.

Please note that the academic calendar, course schedule, and course content are subject to change or revision at any time. The University community will be notified should such changes be necessary.

**Northeastern
University Bulletin
1982-83**



The Northeastern University Bulletin contains *current information* regarding programs, curricula, cooperative education opportunities, career opportunities, campus life, and admissions, and such information is not intended to be and should not be relied upon as a statement of the University's contractual undertakings.

In reading this Bulletin, whether you are using it to make your selection of a college to attend or are trying to select a career goal, a major, a concentration, or even a course, you must keep certain important points in mind.

We at Northeastern will do our best to make available to you the finest education we can provide, the most stimulating atmosphere in which to learn, and the most congenial conditions under which you may enjoy the learning experience. But the quality and the rate of progress of your academic career are in large measure dependent upon your own abilities, commitment, and effort. You will be a full participant in an educational partnership. We will and, indeed, can only make the opportunities available to you; it is up to you to take advantage of them.

This is equally true with your career upon graduation. While we can offer the opportunity through an ever-improving co-op program for you to acquire work experience, which we believe will give you an advantage over some other applicants, we cannot guarantee that you will obtain any particular job. That will depend upon your own skills, achievement, presentation, and other factors, such as market conditions at that time. Similarly, in many professions and occupations there are increasing requirements imposed by federal and state statutes and regulatory agencies for certification or entry into a particular field. These may change during the period of time when you are at Northeastern, and they may vary from state to state. While we will be ready to help you find out about these requirements and changes, it is your responsibility to initiate the inquiry because we cannot know what your expectations and understandings are unless you tell us.

In brief, what we are saying to you is that we are here to offer you educational opportunities and choices and to assist you in finding the direction in which you want to steer your educational experience. But you are a partner in this venture with an obligation and responsibility to yourself.

Northeastern University reserves the right in its sole judgment to promulgate and change rules and regulations and to make changes of any nature in its program, calendar, admissions policies, procedures and standards, degree requirements, fees, and academic schedule whenever it is deemed necessary or desirable, including, without limitation, changes in course content, the rescheduling of classes, cancelling of scheduled classes and other academic activities, and requiring or affording alternatives for scheduled classes or other academic activities, in any such case giving such notice as is reasonably practicable under the circumstances.

The University assumes no liability, and hereby expressly negates the same, for failure to provide or delay in providing educational or related services or facilities or for any other failure or delay in performance arising out of or due to causes beyond the reasonable control of the University, which causes include, without limitation, power failure, fire, strikes by University employees or others, damage by the elements, and acts of public authorities. (The University will, however, exert reasonable efforts, when in its judgment it is appropriate to do so, to provide comparable or substantially equivalent services, facilities, or performance, but its inability or failure to do so shall not subject it to liability.)

Northeastern University Basic College Bulletin 1982–1983

College of Arts and Sciences
Boston-Bouvé College of Human Development
 Professions
College of Business Administration
College of Computer Science
College of Criminal Justice
College of Engineering
Lincoln College
College of Nursing
College of Pharmacy and
 Allied Health Professions
University College
 (Alternative Freshman-Year Program)

The New England Association of Schools and Colleges accredits schools and colleges in the six New England states. Membership in one of the six regional accrediting associations in the United States indicates that the school or college has been carefully evaluated and found to meet standards agreed upon by qualified educators. Colleges support the efforts of public school and community officials to have their secondary schools meet the standards of membership.

Northeastern University supports the efforts of secondary school officials and governing bodies to have their schools achieve regional accredited status to provide reliable assurance of the quality of the educational preparation of its applicants for admission.

The Northeastern University Bulletin (USPS 989-040) is issued at 360 Huntington Avenue, Boston, Massachusetts 02115, six times a year; once in January, twice in August, once in September, and twice in October. Second-Class Postage Paid at Boston, Massachusetts. Volume X, Number 3, August 30, 1982.



A Message from the President

Your decision to study at a university is a commitment to your future, to your aspirations, to the full development of your potential. A degree by itself does not guarantee your future, but the right university can certainly be a crucial factor in shaping that future.

By giving you the opportunity to apply theory to practice, the Cooperative Plan at Northeastern University allows you to test, on the job, the validity of what you learn in the classroom. It also allows you to bring the real world perspective of your co-op job to your studies. Most importantly, co-op encourages you to realistically evaluate your professional goals and abilities. You may simply confirm your original goals, or you may be surprised and discover paths to careers you might not otherwise have considered.

Beginning with co-op, Northeastern makes its close relationship with business, industry, and the professions work to your advantage. Academic programs are constantly updated and faculty challenged with the latest developments in each field.

Because of its location in Boston, Northeastern urges you to become vitally involved in this urban environment. You will develop a social consciousness and sense of responsibility which you will no doubt nurture your entire life. As steeped in tradition as Boston is, it is also one of the most progressive cities in the nation. Much of its daring spirit is due to the inquisitive, bold minds of its college and university students.

I invite you to become a part of this experience—the Northeastern experience—and be better for it.

Kenneth G. Ryder

President

Tuition and Regulations
Tuition rates, all fees, rules and regulations, courses and course content are subject to revision by the President and the Board of Trustees at any time.

Equal Opportunity Policy
Northeastern University is committed to providing equal opportunity for all. In matters involving admission, registration, and official relationships with students—including evaluation of academic performance—the University insists on a policy of nondiscrimination. Northeastern is also an equal opportunity employer. It is institutional policy that there shall be no discrimination against any employee or applicant for employment because of race, color, religion, sex, age, national origin, or on the basis of being a handicapped but otherwise qualified individual. Further, Northeastern will not condone any form of sexual harassment defined as unwelcome sexual advances, requests for favors, and other verbal or physical conduct of a sexual nature as an explicit or implicit condition of admission or registration, as the basis for academic evaluation, or when such conduct interferes with an individual's work or classroom performance by creating an intimidating, hostile, or offensive work or classroom environment. In addition, Northeastern takes affirmative action in recruitment of students and employees. Inquiries concerning our equal opportunity policies may be referred to the University Affirmative Action Officer, Room 175, Richards Hall, telephone: 617-437-2139 or -2133.

Northeastern's efforts to comply with the Title IX Education Amendments of 1972 and Section 504 of The Rehabilitation Act of 1973 are coordinated by the Dean and Director of Affirmative Action.

The Committee on Admissions
Department of Admissions
Northeastern University
360 Huntington Avenue
Boston, Massachusetts 02115
Telephone: 617-437-2200



This *Bulletin* has been designed to help you plan your education and career, as well as provide the information you need to apply for admission.

Naturally, we are enthusiastic about what Northeastern can offer: fully accredited programs in an exciting urban setting, plus something special—the unique learning experience of combined work and study at the institution that developed the Cooperative Plan of Education.

We encourage early application for admission and hope we can be of service to you.



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Part One

About Northeastern



About Northeastern

The Philosophy of Education

Northeastern has never forgotten its original purpose: to offer an education to all qualified students who possess both the desire for additional knowledge and the determination to acquire it in spite of possible hardships.

Because Northeastern is fully aware of the importance of using all its resources to help solve monumental—and universal—social problems, its long experience in creating opportunities for productive work as part of the total educational experience is particularly significant today. The University has also helped many members of minority groups obtain an education.

Northeastern's Boston location and the fact that it is one of the largest cooperative-plan universities in the world provide opportunities for student involvement in areas of national concern. For example, as an undergraduate you may have cooperative work assignments in such areas as air pollution research, rehabilitation, medical research, social service, environmental studies, or law enforcement. Student activities, too, offer a chance to "be where the action is": namely, in a wide variety of community-action programs, many of which help handicapped people, ghetto residents, and minority groups.

Today's socially conscious students often wish to continue their education at the graduate level. In response to this desire, Northeastern has extended its Cooperative Plan to some areas of graduate education. One example is the School of Law, which offers a curriculum substantially developed around the important social issues of our time.

Many prominent educators, including those who are graduates of traditional, non-cooperative-plan schools, are now urging that *all* college students have opportunities for on-the-job experience before graduation. These educators realize that the practical experience thus gained can strengthen college curricula.

Therefore, as a Northeastern student alternating between classroom instruction and cooperative assignments, you could be in a much better position to examine, doubt, and explore than your counterpart at another educational institution. You have the opportunity to test the opinions you have formed. You see society not for what it is, but for what it can be.



Boston and Northeastern

Cherishing its rich history, Boston keeps lively and up to date, largely due to the presence of so many college students. They come from all over the country and, indeed, the world to Boston and Northeastern. Newspapers, magazines, and electronic media are spreading the word: Boston is where the people are.

The Co-op Plan brings the city into the lives of Northeastern students daily. Students contribute to the urban consciousness as they gain valuable practical experience as teachers aides in the integrated schools, business administration interns in law offices and accounting firms, nursing trainees in world-famous hospitals, and future engineers in the nation's leading "high tech" corporations.









Follow the well-worn bricks of the Freedom Trail from Paul Revere's House to Faneuil Hall, Boston Common, and Beacon Hill. Browse in old book shops and wander through the art galleries of Newbury Street. Buy designer originals for an opening at the symphony, ballet, or opera—or jeans for a sail on the Charles.

Lose a day in the shops of the now famous Quincy Market, sample the endless tastes of the North End restaurants and markets, indulge in Boston's world-renowned seafood.

Discover the architecture of the past in the State House, Back Bay, and Beacon Hill. Appreciate the boldness of the present in Government Center, Copley Square Plaza, the Prudential Center, and the Christian Science Center.

Enjoy.

Boston is a city of colleges and cultural centers. Boston University, Simmons College, Emmanuel College, and MIT are within walking distance of Northeastern. So are the Museum of Fine Arts, Symphony Hall, the Gardner Museum, the New England Conservatory of Music, Jordan Hall, Horticultural Hall, the Christian Science Center, and the Boston Public Library.





Accessible by the MBTA subway system, the Boston theatre district gives you a special opportunity to enjoy hit shows before they head for Broadway. It also provides imaginative and talented young artists with a chance to produce their own contemporary plays.



Say "Boston" to sports fans and immediately they think of the Red Sox, Celtics, Bruins, and Patriots. Indeed, many Northeastern students join the crowds at Fenway Park, Boston Garden, and Schaefer Stadium in Foxboro each year to cheer on these professional teams. In addition, there are crew races on the Charles River, tennis at Longwood Cricket Club in Brookline, and some of the best skiing in the country on the slopes of Vermont and New Hampshire.



**Boston is where
Northeastern is—and
Northeastern is Boston.**



The Boston Campus

Located on Huntington Avenue in the Back Bay section of Boston, the main campus of Northeastern University occupies approximately fifty acres, including the same land on which the Boston Americans and the Pittsburgh Nationals played the first World Series baseball game in 1903. Today, the University still provides ready access to baseball games; it is located in close proximity to the Fenway section and Fenway Park, as well as to cultural landmarks such as Symphony Hall, the Museum of Fine Arts, and the Boston Public Library, among others.



The "front door" to the campus is the Yard, or Quadrangle, facing Huntington Avenue, which is accessible to public transportation. The remaining sides of the Quadrangle are formed by Richards Hall, the Ell Student Center, and the Dodge Library. These three buildings were erected following an architectural design contest held in the early 1930s. Their white brick facades and clean lines form the nucleus of an architectural unit that is maintained throughout much of the campus.



The campus also reflects the fact that Northeastern is an urban university. Many University buildings bear the architectural design that characterizes the buildings surrounding the Quadrangle; other buildings have been acquired over the years and refurbished or recycled for the University's use. Many of these buildings were constructed quite some time before Northeastern selected its traditional architectural theme. Many of these buildings reflect the more traditional warmth of old Boston.

The campus itself has been planned to provide freedom of movement within the central academic area of classroom and laboratory buildings. During the ten-minute break between classes, students and faculty are able to reach their next classrooms along the walkways and secondary streets that provide ready access to all centrally located buildings. In addition, a network of underground corridors connects many of the buildings on campus, providing routes that are especially convenient during periods of inclement weather.

During the early 1960s, large dormitory facilities were added diagonally across Huntington Avenue from the Quadrangle. In fact, Huntington Avenue currently forms an approximate divider between the education buildings on the south and the dormitories to the north.

Two blocks and a right turn away from the main quadrangle on campus is the oldest indoor ice-hockey arena in the United States and one of the focal points for amateur athletics in the Boston area. Today, the Arena is primarily devoted to hockey and collegiate sports, but has expanded its university athletic focus to include all men's basketball contests and many women's varsity contests. With more than a million and a half dollars already invested in the Arena, the building is a jewel to the eye and a credit to the community. So long as Northeastern owns the Arena, it will continue to meet the needs of the surrounding community as a superior recreational facility.

As the University continues to expand, parking and recreational areas are periodically relocated on the edge of campus as new buildings are added to the central academic area. At present, the University is planning construction around a second and new "front door" on the southwest border of the campus. In that area, a transit line will be relocated on the site of an old railroad line, and the station at Ruggles Street will also coordinate local bus routes and a suburban commuter rail line. This area is also the location of the newest housing facility on campus, West Hall, a ten-story apartment-dormitory.

Tentative plans for the future of the University include the construction of several new buildings as well as upgrading of the old. A new engineering building and a new library will not only provide more classrooms and research and study facilities, but will also physically form a quadrangle, the key design element of spatial organization at the University. The quadrangle will be an integral part of the new "front door" to the campus. Construction on the engineering building is tentatively scheduled to begin this year and to be completed by the fall of 1983.

A building recently constructed is the architecturally dramatic addition to the Law School. This one-story structure is half below grade, opening into a sunken garden, and has a landscaped plaza on its roof. Over a block long, this plaza is a focal point and gathering spot for the west campus area. Adjacent to this site, a semicircular classroom building has also been recently constructed.

An ongoing renovation program is also providing more accessibility for the handicapped. Existing facilities throughout the University are being updated constantly to provide more efficient classroom, research, and office facilities while still retaining their traditional charm.



A Student's Voice

Like many of my peers, I was undecided in choosing a major during my freshman year. Not until the end of my second year at a large, midwestern university did I become concerned about this pronounced lack of decisiveness. Isolated on a beautiful campus with formal gardens and a winding river, I was free to imagine myself in a different professional capacity each quarter without the pressures of a more realistic environment to provide limitations and direction. I remember being troubled by a poster in an academic adviser's office that stated, "If you don't know where you're going, you're going to end up somewhere else." For me, that was the writing on the wall, and I decided to transfer to a university in an environment that would force me to come to grips with reality. Northeastern University fit this description perfectly. Therefore, I began attending Northeastern in January of 1980 in the Department of Recreation and Leisure Studies.

Two years have passed, and I am now preparing to graduate in June of 1982. Since coming to Northeastern University, I have worked as a recreation therapist in a hospital, as a stockbroker's assistant in an investment banking firm, and in management for the Northeast Regional Office of the National Park Service. The exposure to such a wide range of working environments is invaluable, but the self-knowledge I acquired during employment is even more important to me. I became aware of my strengths and weaknesses, my likes and dislikes, and the type of work I am willing to do eight or more hours per day for five days per week in order to earn a living.

Recently, I had an experience that reinforced my awareness of the benefits of cooperative education. At a job interview for a part-time position, the interviewer remarked that she was impressed with the amount and quality of work experience I had as a student. She proceeded to tell me about the management trainee program offered by her company, and she encouraged me to consider the firm as a possible employer after graduation. You can believe me when I say it felt wonderful to be wanted.

Academically, Northeastern has an excellent faculty. The academic training I have received in my classes enabled me to bring a greater awareness to the jobs I had on co-op and will give me the opportunity to obtain a fine permanent position when I graduate.

I hope your experience at Northeastern University will be as enlightening and beneficial as mine has been to me.

Donna Jean Sells



Innovations in Curricula and Personalized Programs

Coming from almost every state in the nation as well as numerous foreign countries, Northeastern faculty members are chosen for their enthusiasm, their teaching expertise, their ability to stimulate intellectual and scientific curiosity, and a genuine desire to work with people.

Northeastern faculty constantly reexamine and reevaluate curricula to keep pace with the changing needs of their students. As a result of this practice, many opportunities that few other institutions can provide are available here. For example, as a student in the College of Arts and Sciences, you may, if qualified, engage in undergraduate study not provided in conventional degree programs by developing an "Independent Major" with the assistance of a faculty adviser and the counseling services of the Dean's Office. More information on the Independent Major may be found on page 87.

In the College of Engineering, assistance in selecting courses and choosing a major begins in the freshman year. Faculty advisers, each responsible for a small group of freshman students, work under the direction of the staff of the Dean of Students, with the assistance of the Dean's staff in the College of Engineering. Upperclass students are assigned faculty advisers from their major departments. The College of Engineering curricula, under constant review by the departments, are frequently revised to keep current with developments in engineering fields. For example, computer engineering has been added to the Electrical Engineering Program. In addition, a series of courses in Alternate Energy Sources has been introduced into several of the engineering departments.

The newly established College of Computer Science awards the Bachelor of Science degree in Computer Science.

Lincoln College's Bachelor of Engineering Technology (BET) Program is distinctly different from typical engineering curricula. The technology programs provide an opportunity to prepare for what can be a unique and pivotal position on the professional-technologist-craftsman team. The freshman year of the BET program contains course work that can also be used as excellent preparation for entering colleges of engineering.

The College of Business Administration offers a variety of concentrations, plus an option for a self-designed concentration. If you need academic counseling, the undergraduate Business Office of the College offers its services on an open-door basis. There is also a Student Advisory Committee, which represents your interests and viewpoints and prepares teacher/course evaluations.

The University's Boston-Bouvé College of Human Development Professions offers major areas of study in Elementary and Secondary School Teaching, Human Services, Speech and Hearing, School and Community Health Education, Physical Education, Physical Therapy, and Recreation and Leisure Studies. Physical Education students may prepare for elementary or secondary school teaching with options for special concentrations in athletic training, coaching, gerontology, and adapted physical education. There are nonteaching physical education options in cardiovascular health and exercise and sports communication. The Health Education Program offers the opportunity to prepare for teaching in public schools or working as a health educator in a community agency



setting. Recreation and Leisure Studies students may select a specialization from one of three tracks: Therapeutic Recreation, Recreation Management, or Outdoor/Environmental Education and Recreation. The Department of Physical Therapy offers one of the few programs in the United States developed on the cooperative plan with alternating work-study experiences related to the curriculum, thus strengthening classroom and laboratory learning. In fact, all programs in the college are offered on the five-year plan.

Cooperative work experience is particularly important for students in the Boston-Bouvé College of Human Development Professions. Opportunities are available for selected students to receive assignments in cooperative school systems, community or government agencies and institutions, hospitals, or libraries. In these settings, students may enjoy unique experiences that greatly enhance self-confidence and professional growth.

Boston-Bouvé College of Human Development Professions and the College of Arts and Sciences offer an undergraduate major in Human Services to students who, in addition to meeting the requirements of their "home" college, take courses in both colleges. In their junior and senior years, Human Services majors must participate in supervised work experiences. For details of the program, see page 113.

Northeastern's College of Nursing Programs were the first in the country to be offered on a "co-op" basis. Through affiliation with health-care agencies in the Greater Boston area, students are provided a variety of opportunities to acquire clinical experience. Students are assigned a faculty adviser to assist in their career development. The College encourages student representation on the majority of its standing committees.

If you decide to major in Pharmacy, you may select courses in clinical and hospital pharmacy, community pharmacy, or areas that may give you the opportunity to prepare for a research career in one of the pharmaceutical sciences. The community pharmacy externship and clinical pharmacy clerkship courses help to provide additional practical experience beyond the standard co-op assignments.

Students in Allied Health Professions may prepare through classroom study and clinical experience to assume a professional role in one of today's health fields.

If you are interested in pursuing a career in the health-care professions, but are undecided as to which profession is right for you, then explore the Open Option. The Open Option program offers freshmen a core of courses designed to provide a basic scientific background required for each of the professional programs in the College. In the Open Option plan, you may complete the core courses in the first-year curriculum without selecting a profession in which to major and without loss of valuable time. Upon satisfactory completion of the first-year courses, you then select a professional area in which to major.

Medical laboratory science, for example, is an area of health care concerned with the laboratory examination of material necessary for the proper monitoring of health and for the diagnosis and treatment of illness. Working in a variety of specialized fields, such as microbiology, blood banking, hematology, or clinical chemistry, or as a generalist in all these areas, medical laboratory technicians and technologists are respected and important health professionals. Northeastern's program in Medical Laboratory Science offers you the opportunity to prepare for laboratory duties at several levels by combining internship with co-op positions or part-time jobs during your baccalaureate degree program. Upon graduation, you may wish to take national certification examinations or pursue a graduate study program.

The Health Record Administration program offers you the opportunity to prepare for a variety of positions in the area of documentation of health care.

The Respiratory Therapy program helps to prepare students for careers as life-support specialists. The curriculum leads to a Bachelor of Science degree in Respiratory Therapy.

A Bachelor of Science degree program in Toxicology is offered by the College of Pharmacy and Allied Health Professions. This program emphasizes the areas of environmental principles in toxicology, thereby helping to educate students for advanced studies and employment opportunities in clinical, government, and industrial settings as they relate to medical and environmental problems.

The Cooperative Plan and a combination of applied and theoretical courses contribute to the academic program at the College of Criminal Justice. Graduates have found careers in law enforcement, private security, criminalistics, corrections, and rehabilitation and social services, as well as in many other areas of the criminal justice system. Because of the academic nature of the program, many graduates have enrolled in law school or undertaken graduate study in criminology, public affairs, and social work.

It has been said that "the most essential thing in the work of education is that sympathetic touch of life on life. It is by that fine process that personality is developed; matured, and enriched. . . ."

One reason for the success of the Cooperative Plan at Northeastern University is that "touch of life on life," which is made possible by the close association between the more than 800 scholars on the faculty of the Basic Colleges and their students. When you enter Northeastern, you are assigned an academic adviser who works with you during your freshman year on a wide variety of matters concerning your personal and academic development. Advisers are also available for academic counseling throughout your upperclass years. Obviously, it is the student's responsibility to take advantage of these opportunities.



Research

Research, whether performed in the laboratory or on a theatre stage, is vital to a college education. It stimulates all participants and ensures a thriving academic atmosphere. Through research, faculty members as well as students stay abreast of the most recent developments in their particular fields. Faculty who disseminate this knowledge, through publishing, speaking, and teaching, help assure a university education of the first order.

At Northeastern, we take research and scholarly endeavors very seriously. Each year, more faculty receive funding for an ever-increasing number of research projects. Sponsorship comes from a variety of places. Federal agencies, private industry and foundations, and the University itself all contribute to Northeastern's enriched research emphasis.

While much of this research is carried out by the faculty members, their graduate students, and post-doctoral research associates, ample opportunities also exist for undergraduate students. Research participation can be included as part of regular academic programs, as specially designed independent studies, or through cooperative work assignments. Research opportunities are encouraged and limited only by the student's own motivation and curiosity.

Northeastern University has numerous distinguished faculty members, many of whom have received prestigious awards, including Sloan Scholarships, Guggenheim Fellowships, and National Institutes of Health Research Awards. Faculty members lecture the world over—from just across the Charles River in Cambridge, Massachusetts, to across the Pacific Ocean in Sidney, Australia.

Additionally, many faculty serve as United States government consultants and participate on a variety of national and international committees.

But, because Northeastern considers teaching its primary mission, you'll always find an enthusiastic and accessible faculty to answer questions, solve problems, and stimulate your mind.

Current research spans almost every academic and professional field and is not limited to laboratory investigations or the "hard" sciences. Every department of every college at Northeastern carries out some basic or applied research projects.

A brief summary of some of the topics presently under investigation by current faculty and students follows. Perhaps something here will spark hidden interests that you never realized you had. If you'd like to explore the opportunities for research participation, you should inquire at the appropriate departmental offices.

In the College of Arts and Sciences research projects reflect the diversity of its seventeen departments. Research in the humanities and the natural and social sciences includes studies in 19th century Boston architecture, the off-off Broadway theatre, cable TV, quantum field theory, and infrared spectroscopy.

As part of the College's interdisciplinary interest in marine sciences, the Marine Science and Maritime Studies Center has been established. At its Nahant field station and laboratory, faculty and graduate students carry on research in marine chemistry, biology, and botany.

Research in the College of Engineering encompasses some of today's hottest technological subjects. Robotics, telecommunications, space rocketry design, and the latest in computer graphics are major fields of interest within the College. But not all studies are high technology oriented. Indeed, some faculty pursue projects dealing with the electrical properties of human blood vessels, while others investigate the components of Venezuelan red mud. These seemingly diverse research areas do have one thing in common, however: they deal with the improvement of our quality of life.

The College of Criminal Justice is one of the few institutions of its kind in the United States to study crime and law in an interdisciplinary fashion. Lawyers, social and forensic scientists, and system specialists are encouraged by the College to participate in research activities focusing on both crime detection and prevention. Some research directions currently pursued by faculty include industrial espionage, private security systems, and contemporary terrorism.

The School of Law's research activities concentrate on the legal system from a perspective encompassing the past, present, and future. Topics include an historical look at the Securities and Exchange Commission, a present view of new civil procedures, and some future musings on the effects of a landmark court case on the mental health profession. Law school curricula also come under investigative scrutiny.

The nature of research in Boston-Bouvé College of Human Development Professions is broad in range and diverse in approach. Changes in human development and the roles of the teacher and clinician in facilitating such changes are lively topics of interest being examined across a wide spectrum of theoretical and applied research. Some of the current research interests of faculty and students include the communication abilities of normal and hearing-impaired individuals, the role of exercise in cardiovascular health and disease, the relationship between age change and the development of motor and cognitive skills in children, the evaluation of clinical practice in physical therapy and educational practices in the schools, and the examination of barriers to the employment of the disabled in leisure services.

The School of Nursing, through its research activities, addresses some of the important problems currently facing the entire nursing profession. One answer to nursing burnout may be found in the School's new school nurse practitioner program. Assessments of this new direction in nursing as well as other employment possibilities and problems are areas in which the faculty are directing their research efforts.

Research objectives in the College of Pharmacy and Allied Health Professions have important ramifications for everyone's better health. Studies include investigating new ways to analyze antidepressant and anti-convulsant drugs, improving methods to diagnose bladder cancer, and studying clinical applications in respiratory therapy. The National Institutes of Health, Dow Chemical Company, and the American Heart Association sponsor some of this work.

Research within the College of Business Administration divides itself between the theoretical and practical aspects of management, human resources, and marketing. New ideas in corporate practice and academic theory are being realized through conclusions reached by a faculty examining such topics as high technology management, small business entrepreneurship, and foreign investment in developing countries. Other studies concentrate on transportation problems in the U.S., government regulation in industry, and technological forecasting in high technology firms.

Northeastern University is its own research subject for the Cooperative Education Research Center. Through an annual census and other statistical surveys, data on cooperative education are compiled. Because Northeastern University is a major force in cooperative education in this country, it seems only appropriate that this information clearinghouse and research facility should be located here. Conclusions reached may affect your own education, since they cover cooperative education's impact on college costs, career opportunities, and life satisfaction.

To meet the needs of the entire academic community, Northeastern also has several interdisciplinary centers and institutes. While not granting degrees, they perform a variety of interesting and relevant research.

The Institute of Chemical Analysis, Applications, and Forensic Science has as its goal basic research in the fields of analytical chemistry and material science and its application to problems of social relevance. The Institute has developed an international reputation in the fields of chromatography, mass spectrometry, amorphous metals, and solar-energy storage devices.

The Center for Electron Microscopy is a self-contained research unit that utilizes the latest scientific equipment for training and research in cellular and subcellular structures.

Research on critical issues in education and a forum for the exchange of ideas and information are provided through the Institute for the Interdisciplinary Study of Education. Research is a primary activity of IISE. The high technology industry, South African education, and community college programs for prisoners are just a few of its numerous research projects.

The Center for Applied Social Research is a University-wide institute that deals with issues of public policy and social research. Projects are presently under way in the fields of criminal justice, public safety, mental health, social welfare, and education.

The Cooperative Plan

The Cooperative Plan brings relevance to your college education. By offering a schedule that alternates classwork and off-campus experiences, Northeastern helps you to realize your potential and develop personal maturity. The process itself—as you compare classroom theory with its realistic application—enlivens classwork. Upon graduation you will have not only a degree, but also up to two years of valuable experience to offer a potential full-time employer. In addition, the money you earn on cooperative assignments can help to defray the cost of tuition, books, and incidental expenses.

You will be assigned a faculty coordinator who is responsible for all phases of your cooperative program and who will assist you in deriving greater value from your education at Northeastern. Personal interviews, in which your academic progress and evaluations of your previous work experiences are reviewed, provide the basis for referral to specific opportunities that could help you realize your career objectives. Your coordinator is a specialist who keeps abreast of activities in specific areas in order to provide counseling on opportunities and trends in these areas. In general, starting assignments tend to be of a routine nature, to be followed by increasingly professional applications as your education and abilities increase. Subject to economic conditions and your willingness to consider alternative opportunities, you can expect to work on responsible and challenging assignments during your participation in the program.

At some point in your program, you may wish to participate in an activity other than paid employment during a cooperative period. You may wish to travel abroad, spending time in one or several foreign countries learning about the customs, the culture, and the people. You may wish to volunteer your services to your local hospital or spend some time on an Indian reservation in the Southwest. Or you may wish to take specialized courses at another institution. Time to engage in these and similar activities can be arranged with your coordinator as a part of your Cooperative Education Program.

Most cooperative curricula leading to the baccalaureate degree require five years. Programs consist of a freshman year of three consecutive quarters of full-time study followed by four upperclass years in which you alternate periods of classroom attendance at Northeastern with periods on cooperative assignment. Some programs vary slightly from this pattern to meet professional requirements in their particular fields.

Associate degree programs in Allied Health Professions require three years to complete, with two upperclass years on co-op.

Participation in the Cooperative Plan is a requirement for all students in the Basic Colleges except those enrolled in the College of Arts and Sciences. Although the majority of students in the College of Arts and Sciences choose to take advantage of the Cooperative Plan, the College offers its students the opportunity to select a “full-time” program in which eight quarters of upperclass study may be completed in three years.

Further details on the cooperative program are available in a booklet entitled *Co-opportunities*, which the Department of Admissions will be happy to send you on request.



Alumni Association

More than 87,700 alumni are united within the Alumni Association, created to establish a mutually beneficial relationship between Northeastern and its graduates. The Association is governed by an Executive Committee elected from the alumni community. Membership to the Association is automatic upon graduation.

The Association is headquartered in the Office of Alumni Relations in 310 Churchill Hall; telephone 617-437-3186. The official records and addresses of alumni are maintained in the Office of Alumni Records, telephone 617-437-2792.

Activities of the Association include the Homecoming celebration, presentation of the Outstanding Alumni Awards, and the annual presentation of Professional Promise Awards to outstanding seniors in each of the Colleges. Alumni officers, in conjunction with the Office of Alumni Relations, have established a series of enrichment/education programs to meet the contemporary vocational and avocational needs of Northeastern's graduates. The Alumni Association has also initiated a successful group travel program to provide the alumni of Northeastern with interesting and economical opportunities for foreign travel. Notice of all activities is provided in *The Northeastern Alumni Magazine* and in special publications.

Regional alumni clubs have been established from coast to coast. All alumni are eligible to become members of these organizations. The clubs meet periodically with varied programs, often in conjunction with professional and athletic events, faculty visits, and service projects. Additionally, alumni class organizations conduct reunions for their respective classes every five years.

The Association sponsors and assists constituent organizations that focus on common professional and avocational interests and college affiliations. These groups have their own officers and conduct various programs throughout the year.

Regional alumni clubs provide a valuable service to the University by sponsoring admissions conferences for high school students and the parents of students who are interested in attending college. In addition, alumni volunteers in many metropolitan areas across the nation represent the Admissions Office on a continuing basis at high schools and community colleges.

Part Two

Academic Programs



Academic Programs

Quarter-Hour Credits

Northeastern University operates on a quarter-system calendar. All courses are evaluated in terms of quarter-hour credit. A quarter-hour credit is equal to three-fourths of a semester-hour credit.

Classes at Northeastern are scheduled in different modules.

In assessing quarter-hour weights for courses, the following statement applies.

One quarter hour of credit is equal to fifty minutes of instruction per week, plus two hours of preparation.

Tuition and Regulations

Tuition rates, all fees, rules and regulations, courses, and course content are subject to revision by the President and the Board of Trustees at any time.

Undergraduate Majors

College of Arts and Sciences

Bachelor of Arts or Bachelor of Science

African-American Studies

Art

Biology

Chemistry

Drama

Economics

English

Geology

History

* Human Services

Journalism

Linguistics

Mathematics

Modern Languages (French, German, Italian, Russian, Spanish)

Music Literature

Philosophy

Physics

Political Science (including a concentration in Public Administration**)

Psychology

Sociology-Anthropology

Speech Communication

* Bachelor of Arts only ** Bachelor of Science only

Boston-Bouvé College of Human

Development Professions

Bachelor of Science in Education

Early Childhood

Elementary Education with Emphases:

Humanities

Reading-Language

Social Sciences

Special Education

Human Services

Physical Education

School and Community Health Education

Secondary Education Majors:

Biology

Mathematics

English

Social Studies

General Science

Speech and Hearing

Bachelor of Science in Physical Therapy

Bachelor of Science in Recreation and Leisure Studies

College of Business Administration

Bachelor of Science in Business Administration

- Accounting
- Entrepreneurship and New Venture Management
- Finance and Insurance
- Human Resources Management
- International Business Administration
- Management
- Marketing
- Transportation and Physical Distribution Management

College of Computer Science

Bachelor of Science in Computer Science

College of Criminal Justice

Bachelor of Science in Criminal Justice

College of Engineering

Bachelor of Science

- Chemical Engineering
- * Civil Engineering (Environmental option available)
- * Electrical Engineering
 - (Computer Engineering and Power Systems options available)
- Industrial Engineering
- * Mechanical Engineering
- Unspecified-general engineering program
- * Also offered as part-time evening program

Lincoln College

(Five-Year, Day Cooperative Program)

- Bachelor of Engineering Technology
 - Electrical Engineering Technology
 - Mechanical Engineering Technology

College of Nursing

Bachelor of Science in Nursing

- Transfer program for Registered Nurses who want to earn their
 - Bachelor of Science in Nursing
 - Full-Time Day Program
 - Part-Time Evening Program

College of Pharmacy and Allied Health Professions

Bachelor of Science

- Health Record Administration
- Medical Laboratory Science
- Pharmacy
- Respiratory Therapy
- Toxicology

Associate in Science

- Respiratory Therapy

Open-Option: Common freshman-year health track available for undeclared majors

University College

Alternative Freshman-Year Program (Self-Paced Program)

Degree requirements: 172–222 quarter hours (requirements vary with major).

College of Arts and Sciences

Richard Astro, Ph.D., *Dean*

J. Edward Neighbor, Ph.D. *Associate Dean and Director of Graduate School*

Joanne Loscalzo, M.A., *Assistant Dean (Curricular Affairs)*

Timothy P. Perkins, M.A., *Assistant Dean (Special Projects)*

Ruthann T. Stiles, M.A., *Assistant Dean (Financial Affairs)*

Deborah J. Hartry, M.Ed., *Assistant Dean (Graduate and Undergraduate Student Affairs)*

E. Wallace Coyle, Ph.D., *Assistant to the Dean (Undergraduate Student Affairs)*

Mary Mello, M.A., *Assistant to the Dean (Undergraduate Student Affairs)*

Gail F. Leclerc, M.Ed., *Assistant to the Dean (Graduate Student Affairs)*

Four- and-Five-Year Programs The College of Arts and Sciences offers a wide range of courses and degree programs enabling students to plan a course of study in keeping with their own interests and aptitudes. Students in the College may earn a Bachelor of Arts in all major programs or a Bachelor of Science degree in most major programs. For either degree, the student is initially admitted to the College in one of two broad areas of study by department: social sciences-humanities, or sciences-mathematics.

Upon acceptance, students are placed into freshman and sophomore courses designed to suit their abilities, needs, and prospective major affiliations. These placement categories are as follows: honors, regular, regular with modification, and special. The latter two categories may require that students undertake studies in basic skill development to improve their chance of success in college. These placements are determined by faculty, subject to review during orientation week. Continued monitoring by faculty and/or staff advisers aids students appropriately to prepare to enter their major fields of study.

In all majors, students may choose between a four-year full-time program and the five-year Cooperative Plan, which offers opportunities for gainful employment or experiential assignments. Students who choose the Cooperative Plan are normally eligible to participate when they achieve sophomore status or above.

The Freshman Program

The freshman-year program consists of three quarters of course work with the selection of courses in five or six different subjects, depending on a student's intended major. Normally, a student takes four courses in each quarter, a total of twelve for the year. All freshmen are required to take two quarters of English (one quarter each of composition and literature). In most majors, one quarter of college-level mathematics and two quarters from each of the wide-ranging divisions of the curriculum (humanities, natural sciences, social sciences) are also required.

The Upperclass Years

As in the freshman year, faculty guidance is available to upper-class students in choosing and, assuming satisfactory maintenance of academic standing, gaining entry by petition to a major field of specialization. After the decision is made, upper-class students are identified with their department, its faculty, and other students in the same major field.

Graduation Requirements

Quantitative Candidates for either the Bachelor of Arts or Bachelor of Science degree who entered in or after the fall quarter of 1974 must successfully complete 176 quarter hours of credit, of which thirty-two quarter hours may be taken outside the College of Arts and Sciences.

Residency Candidates must complete either 75 percent of the degree credit at Northeastern or the last three full quarters (a minimum of twelve full courses) at Northeastern.

Qualitative Candidates must achieve a minimum cumulative average of 2.0 (grade of C).

Freshman English All degree candidates must complete one quarter of Freshman Composition and one quarter of Introduction to Literature. Normally, this will be done by completing courses 30.113 and 30.114 at Northeastern.

Major Candidates must complete successfully the courses specified as major requirements. A complete listing of these required courses is published in the *Basic Day College Course Descriptions and Curriculum Guide*.

Distribution All course work offered in the College of Arts and Sciences curricula is identified within one of three broad areas: humanities, social sciences, and science-mathematics. All Bachelor of Arts candidates (and Bachelor of Science candidates in English and Speech Communications) must complete forty quarter hours in the two areas outside of their major. For example, a major in History, which is considered a social science, must complete forty quarter hours of course work in the humanities and science-mathematics areas. The course work for distribution must contain a minimum of sixteen quarter hours in one area and twenty-four quarter hours in the other area of the curriculum. A major in History, for example, satisfies the requirement by completing course work in one of the following ways: sixteen quarter hours in humanities and twenty-four quarter hours in mathematics and/or science, or twenty-four quarter hours in humanities and sixteen quarter hours in mathematics and/or science, or twenty quarter hours in mathematics and/or science and twenty quarter hours in humanities. The departments/majors are listed here with the appropriate curriculum area headings:

Humanities Art, Drama, English (all offerings beyond the freshman level), Modern Languages (all offerings except elementary levels), Music, Philosophy, Journalism, and Speech Communications courses.

Social Sciences African-American Studies, Anthropology, Economics, History, Human Services, Political Science, Psychology, Sociology, and Linguistics.

Science-Mathematics Biology, Chemistry, Mathematics, Earth Sciences, and Physics.

To determine the distribution requirement met by a course if selected from the interdisciplinary programs in Human Services, African-American Studies, or Linguistics, students are advised to consult an academic adviser in the Dean's office.

Foreign Language All candidates for the Bachelor of Arts degree (and candidates for the Bachelor of Science degree in Biology) must attain a level of proficiency in a modern foreign language indicated by passing grades in intermediate-level college courses or by meeting a comparable criterion that has been approved by the Modern Languages Department.

A **conditional exemption** from this requirement may be granted in the following situations:

- 1) students who earned an average grade of C or better in a full, four-year language sequence in secondary school
- 2) students who earned an average grade of A in a three-year language sequence in secondary school.

A conditional exemption **must** be confirmed by taking a proficiency examination during the first quarter at the University. A sufficiently high score will verify the exemption; otherwise the student will be advised of the appropriate language course to take in the following quarter.

An **absolute exemption** will be granted to students:

- 1) for whom English is a foreign language
- 2) who receive a score of 550 or better in the Language Achievement Examinations.

For students who have not met the foreign language requirement at the time of entrance, the entry level into foreign language study depends upon the scope and level of prior study. The normal sequence for students with no prior preparation is two quarters of elementary-level language and two quarters of intermediate-level language. The Modern Languages Department will determine an appropriate entry point at which students who have partial language preparation may begin completing the requirement.

Graduation with Honors

Candidates who have completed all degree requirements and have attained superior grades in their academic work will be graduated with honor (3.000 to 3.499 cumulative average); high honor (3.500 to 3.749 cumulative average); or highest honor (3.750 to 4.000 cumulative average). Transfer students who have completed all degree requirements and at least six full quarters of course work in the College of Arts and Sciences at an honors level as defined above may graduate with honors. The course work completed at other institutions, however, when weighed and averaged in with Northeastern University's work, must equal the University's honors level. The level of honors designated on the Northeastern diploma and transcript shall be no higher than the honors level attained as a Northeastern student.

Commencement Exercises

The College of Arts and Sciences holds commencement exercises each June and September.

Accreditation

All programs in the College of Arts and Sciences are fully accredited by the New England Association of Colleges and Secondary Schools.

Honors Programs

General Description The Honors Program of the College exists to meet the needs of highly motivated and academically successful students at Northeastern. The program does not grant degrees, nor does it have a standard curriculum for all its students, but it does offer an assortment of special courses and activities. The Honors Program curriculum consists of 1) some of the courses required for freshmen (English and mathematics), 2) interdisciplinary and survey seminars as honors alternatives for elective courses, 3) one-credit-hour "mini-courses" on a wide range of subjects, and 4) the opportunity for Honors Program students to undertake a special individual honors project under the supervision of a faculty adviser in the junior and senior years. These courses make extra demands, but because they are limited in size, aim for greater breadth and depth of inquiry, and promote close interaction between faculty and students, the Honors Program curriculum offers especially stimulating educational opportunities. A student's participation in any honors course is noted clearly on his or her transcript, something that may often help in making application for employment or admission to graduate school.

Through the efforts of an advisory council of students in the program and a faculty honors committee, the Honors Program also sponsors a number of cultural and social events, as well as a speaker series. Some of these events are sponsored by the program for the benefit of the entire University community. Others afford honors students an opportunity to associate in circumstances less formal than the classroom, where they can get better acquainted and participate in the more casual discussions that make up such an important part of a university education.

For further information on Honors Program courses and activities, please consult the *Basic Day Colleges Course Description and Curriculum Guide* and call or visit the Honors Program Office, 153 Cahners Hall, telephone: 437-2333.

Eligibility Freshmen are admitted directly into the Honors Program on the basis of their College Entrance Examination Board test scores, high school academic records, teacher recommendations, and extracurricular achievements. Students already enrolled at Northeastern are eligible to participate in the program if they achieve a cumulative quality-point average (QPA) of 3.500. In order to encourage the development of a sense of community among honors students, something which comes partially through continuity in program participation, continued academic eligibility for any student who has met the initial criteria and participated in the program can be maintained with a 3.400 cumulative QPA. Honors students whose grades fall below a 3.400 have two quarters of probation in which their eligibility continues while they bring their average back up to the 3.400 minimum.

Junior-Senior Honors Projects Juniors and seniors who have participated and maintained eligibility to participate in the Honors Program or who have done superior work in their majors and have a high overall academic record are invited to apply to the Honors Committee to do special honors work during two or three of their last four quarters at Northeastern. Such work normally takes the form of a special research project, scheduled as a four-credit-hour course during each term in which it is pursued.

Eligibility The Faculty Honors Committee of the College of Arts and Sciences has established these standards for junior-senior honors project eligibility:

Minimum of 3.500 cumulative quality-point average (QPA) at Northeastern as of the time of application, or maintenance of eligibility (3.400 QPA) for previous Honors Program participants*

No F's or I's

No C's or D's in major field.

Sometimes, with the approval of the major department and the Honors Committee, exceptions can be made. The Honors Committee invites all eligible students to apply for the program and also reviews applications from students normally not eligible, but asking for special consideration. Requests for special consideration can be made by faculty members on behalf of students they deem to be serious and highly motivated scholars.

No more than four quarter hours of honors work may be taken each term unless the Honors Committee grants special permission. Students must register in their departments for the appropriately numbered honors course, for which they receive a grade from their advisers at the end of each term. The Honors Committee and the student's major department insist that the student's honors work remain consistently excellent. Should the work fall below standard, the project will be subject to review and possible termination.

Written application for an honors project must be submitted to the Honors Program Office. This application is reviewed by the Honors Committee (composed of faculty of the college) and approval is based on the merits of the individual proposal. For information regarding eligibility, deadlines, or completion of the application, a student should consult the Honors Program Director, 153 Cahners Hall, telephone: 437-2333.

*Applicable only to students who matriculate in fall 1978 or later. Students entering prior to fall 1978 must have a minimum QPA of 3.000.

Combined Program with Professional Schools

Students who have completed at least three-fourths of the course work required for a baccalaureate degree in the College of Arts and Sciences and are accepted into an approved professional school of dentistry, law, medicine, optometry, osteopathy, or veterinary medicine will be eligible for the Bachelor of Arts or Bachelor of Science degree at the end of their second year in professional school. At least two-thirds of work for the baccalaureate degree must be earned in residence at Northeastern, and all other College of Arts and Sciences requirements must be fulfilled, the residence requirement having been completed prior to entrance into the professional school. Under this program, a preprofessional student may reduce by one year the time normally required for obtaining both the undergraduate and professional degrees.

Student Services

Arts and Sciences Dean's Office The Arts and Sciences Dean's Office, located in 403 Meserve Hall, is the central administrative office for all upperclass students majoring in Arts and Sciences programs. In addition to the academic counselors who are located in the various departments of the College, the Arts and Sciences Dean's Office staff is available to all students for academic assistance. Counselors in the Dean's Office work closely with departmental advisers to help the student work out a program of study and take care of any problems the student may have relating to administrative procedures of the College.

The Dean's Office is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, during the fall, winter, and spring quarters, and from 8:00 a.m. to 5:30 p.m., Monday through Thursday, during the summer quarter. Students are encouraged to make appointments with counselors during any of these times. The phone number is 437-3982.

Preprofessional Advising For information on preprofessional advising, see page 276.

Graduate School Advising The Northeastern Graduate School of Arts and Sciences and the Department of Graduate Placement Services offer information and advice on graduate school admissions procedures, preparation of applications, and the scheduling of examinations required for postgraduate programs.

Cahners Hall Math/Writing Center All math and English remedial courses are taught in classrooms in Cahners Hall, the new Math/Writing Remediation Center. The facility includes a Writing Center and a Math Workshop, where students may receive individual tutoring. In addition, Cahners Hall has five computer terminals and a printer which are used to teach problem-solving strategies in the remedial math courses.

Special Programs

Center for Humanities The Center for the Humanities at Northeastern University supports teaching and research activities in cross-disciplinary areas that connect the traditional humanities with science and mathematics, and with such professional curricula as engineering, business, criminal justice, and allied health. Though it offers no courses, the Center promotes the application of human-values perspectives and problem-solving techniques to the professions in various conferences, workshops, and presentations. The Center is located in 443 Meserve Hall.

Division of Fine Arts Programs The Division of Fine Arts in the College of Arts and Sciences comprises the Departments of Art, Drama, and Music, together with the Office of Creative Arts and a variety of related activity centers. The Division of Fine Arts serves to coordinate and stimulate both academic and nonacademic fine-arts efforts at the University, including programs of study, performances, exhibits, shows, and other artistic productions and enterprises. It also oversees relations between the University and professional arts groups with whom there may be continuing affiliations. The Division is under the supervision of the Director of Fine Arts.

Sea Quarter Program Beginning with the fall term of 1982, students have the opportunity to study for one quarter at sea aboard the schooner *Harvey Gamage*. Four academic marine courses and navigation/seamanship training are offered during eight weeks of cruising from Boston to the Bahamas. The unit fee for this experience (tuition, room and board) is the same as the sum of tuition, room and board for one quarter on campus. The ship is fully licensed and insured, and its owner and officers have several years of experience in conducting the Sea Quarter Program. For further information, students should contact the Sea Quarter Office in 443 Meserve Hall.

For additional special programs in the College of Arts and Sciences, consult page 87.

African-American Studies

An interdisciplinary program focusing on the black experience

Associate Professor

Holly M. Carter, Ph.D.

Assistant Professors

Carolyn W. Arnold, D.Sci.

Jordan Gebre-Medhin, Ph.D.



Professional Preparation

Aims The African-American Studies Program at Northeastern University offers an interdisciplinary study of the black experience with two central purposes: 1) to provide academically rigorous and exciting courses for all students interested in the field, and 2) to contribute to the students' ability to develop research and analytical skills and to apply this learning, whatever their disciplines or career objectives.

By presenting fresh perspectives while remaining firmly grounded in traditional academic standards, the courses in the African-American Studies Program may aid the student in developing the skill of critical thinking. In addition, the curriculum is designed to present the student the opportunity to attain a facility with language. Both of these skills—sound thinking and effective use of language—are symbols of a meaningful liberal arts education and help to form a strong basis for professional or graduate work.

Description of the Major A major in African-American studies offers preparation for a wide range of professions, including education, law, medicine, and business.

Students majoring in the discipline may select an area of concentration from seven subject areas and work under the supervision of a faculty adviser.

Students from other disciplines should find that the courses in African-American Studies are designed to complement and enrich their chosen concentrations.

A View of the Major Courses in the discipline are organized under seven major subject areas: applied science, economics, education, history, humanities, political science, and sociology/psychology. Courses taken in the discipline may be credited toward degree requirements for all Arts and Sciences students.

African-American Studies majors may study for either the Bachelor of Arts (B.A.) or Bachelor of Science (B.S.) degree. All majors are required to take the following subjects:

- Economic Issues in Minority Communities
- Directed Study for Senior Thesis
- Field Research Seminar for Seniors
- African-American Literature I
- Contemporary Issues in Black Society
- The Black Family
- African-American History I
- Research Seminar
- Public Policy Analysis
- Race Relations in America

Faculty advisers work with students to help them select electives within their chosen areas of concentration to fulfill their distribution and language requirements for the degree of Bachelor of Arts, or career package programs for the degree of Bachelor of Science.

Description of the Minor In an effort to meet the educational career needs of students who are majoring in other areas, but have special interests in African-American Studies, the Program offers a minor in African-American Studies. The minor consists of a core of three required courses, as well as courses selected from a broad range of electives and minor concentration clusters to accommodate individual needs. To qualify for a minor in African-American Studies, a student must successfully complete twenty-eight quarter hours in the field, as indicated below:

Required Courses

- African-American Studies
- Research Seminar
- Race Relations in America

Department of Art and Architecture

Peter Serenyi, Ph.D., *Professor and Acting Chairman*

Professor

Robert L. Wells, M.A.

Associate Professors

Samuel S. Bishop, M.A., M.F.A.

Ronald C. Davis, M.Ed.

Wheaton A. Holden, Ph.D.

Assistant Professor

T. Neal Rantoul, M.F.A.



Professional Preparation

Aims The visual arts, mankind's oldest form of artistic expression, offer a deeper understanding of man and the cultural forces that have affected him historically. Moreover, as visual communication becomes more widespread in the contemporary world, the use and understanding of visual language must be seen as a necessary part of the educational process.

In view of this, the aim of the Department is threefold: (1) to introduce art and architecture both as history and as creative activity in the context of a broad liberal arts education; (2) to offer a more focused study of the visual arts through a critical examination of both the language and content of art and architecture in the context of a particular historical period, or through the hands-on experience of a studio setting; and (3) to provide an opportunity for a solid academic foundation to those who wish to pursue a career in art and architecture, or related fields.

One of the main resources of the Department is Boston itself, whose architecture spans three hundred years, whose museums are world famous, whose galleries and cinemas offer the latest in their respective areas, and whose public library is one of the best of its kind. Learning to use these resources systematically is an all-embracing aim of the Department.

Description of the Major The Department offers three concentrations within the major: (1) history of art and architecture, (2) studio art, and (3) architecture. Courses in the history of art and architecture cover the major periods of the Western World from Ancient to Modern, with a focus on 19th and 20th century Europe and America.

The studio concentration includes painting, drawing, printmaking, architecture, film, and photography. Studio courses are complemented by courses offered in the theory and criticism of these art forms. The best work created in the studio courses is exhibited in the annual student show at the University Art Gallery.

A View of the Major The Department offers both a Bachelor of Arts degree and a Bachelor of Science degree program. Students in the B.A. program must meet the foreign language and distribution requirements of the College. Students in the B.S. program are exempt from these requirements, but are encouraged to select two concentrations within the Department or a minor outside the Department to have the opportunity to acquire greater competence in a given field of specialization. In both programs the requirements for the major are the two-part survey course in art history, twelve electives in art and/or architecture, plus one elective each in music and philosophy and two in history. Art courses not offered by the Department may be taken in one of the neighboring art schools or universities with prior approval.

Majors may pursue either a four-year full-time program or a five-year cooperative plan of study. Transfer from one to the other is possible, and registration in either can be reversed. Cooperative work assignments include positions in museums, libraries, historical collections, archives, and the Northeastern University Art Gallery.

The Minor The Department offers a minor program for students majoring in other fields of study. The program consists of a general minor and the following four concentrations: history of painting, architecture, film and photography, and studio art. The number of courses required for the minor does not exceed seven. Students interested in the minor program should consult the Department.

Biology Department

David C. Wharton, Ph.D., *Professor and Chairman*

Professors

Francis D. Crisley, Ph.D.
Janis Z. Gabliks, Ph.D.
M. Patricia Morse, Ph.D.
Nathan W. Riser, Ph.D.
Fred A. Rosenberg, Ph.D.
Ernest Ruber, Ph.D.

Associate Professors

Kostia Bergman, Ph.D.
Charles H. Ellis, Jr., Ph.D.
Helen H. Lambert, Ph.D.
Charles A. M. Meszoely, Ph.D.
Joseph V. Pearincott, Ph.D.
Daniel C. Scheirer, Ph.D.
Phyllis R. Strauss, Ph.D.
Henry O. Werntz, Ph.D.

Assistant Professors

Joseph L. Ayers, Ph.D.
Donald P. Cheney, Ph.D.
Duncan R. Munro, Ph.D.
Michael D. Strauss, Ph.D.

Adjunct Professor

Bruce B. Collette, Ph.D.

Professional Preparation

Aims The Biology major offers students the opportunity to develop a fundamental background in the organization and the processes of life, from the level of molecules and cells through the level of organs and organ systems to the level of populations, species, ecosystems, and evolution. The major also offers the mathematical, chemical, and physical background necessary to understand biology and may help to train students in practical scientific skills associated with each of these areas of study. Finally, it allows students to begin to specialize in a subdiscipline of biology.

Description of Major The major consists of ten biology courses in addition to those required in chemistry, physics, and mathematics. Six of the biology courses constitute a required core sequence: Principles of Biology I, II, and III; Environmental and Population Biology; Genetics and Developmental Biology; and Cell Physiology and Biochemistry. A student normally should take the core before taking a required minimum of four upperclass biology electives. It is usually possible to follow the prescribed sequence if a student has decided on the major in the freshman or sophomore year. For students who may enter the major in the middler year, it is often possible to complete the major in the normal time by taking some of the electives concurrently with core requirements, provided the students previously have taken freshman-level science and mathematics.

To graduate with a major in Biology, a student must have a cumulative Quality Point Average (QPA) of 2.000 for all science and mathematics courses required for the major. There are two programs within the Biology major, one leading to the Bachelor of Arts degree and the other to the Bachelor of Science degree. The B.A. program retains the College's requirements in humanities and social sciences; the B.S. program is more rigorous and extensive in its mathematics and science requirements and thus offers better preparation for postgraduate study. The difference is mainly one of emphasis, however, and it is possible for a student to meet both sets of requirements.

After completing the core program, students interested in independent research may arrange with individual faculty to undertake Directed Study; if eligible, they may be invited to undertake a more extensive Honors Program involving up to four quarters of research.

The Department publishes a booklet, *The Biology Undergraduate Advisory Handbook*, which explains the required and recommended courses and the QPA standards in science for Biology majors. The *Handbook* is available in the Biology Office, Room 403, Richards Hall. Students intending to major in Biology should obtain a copy as early as possible after their enrollment at Northeastern. Biology majors wishing to pursue a minor in another field should see their biology adviser as early in their program as possible, for coordination of major and minor requirements.

A View of the Major The Biology major provides an opportunity for excellent preparation in a wide variety of careers or professions in the life sciences, including medical, dental, and other health-related professions. Graduate study leading to a master's or doctoral degree can open careers in upper-level teaching and/or research in one of the specialized areas of biology, such as zoology, botany, microbiology, physiology, ecology, marine biology, cell biology, or biochemistry. Biology majors may also go into postgraduate training in such health-related areas as nutrition, public health, or medical technology.

Biology majors not wishing to enter professional or graduate schools may find employment on technical levels in federal, state, industrial, hospital, or university laboratories doing research, survey, or quality control in a biological area. After graduation they may also be able to enter directly into positions in industries involved in the manufacture and distribution of pharmaceuticals, biological products, food, or scientific equipment. Many biologists are employed at all levels in fisheries, forestry services, county agencies, museums, aquariums, research vessels, and marine stations.

Preprofessional students (for example, premedical or predental) are urged to consult with the preprofessional advisory committee early in their careers at Northeastern. *Students are cautioned that the successful completion of the required preprofessional courses by no means ensures admission to a professional school since the number of applicants usually far exceeds the space available.*

Laboratories

The Biology Department has specially equipped teaching laboratories for general biology, botany, anatomy, microbiology, microscopy, physiology, zoology, and cell biology. Equipment for field work, museum specimens, models, charts, and closed-circuit television are employed in laboratory instruction. Additional facilities include aquarium and animal rooms, stockrooms, preparation rooms, research areas, and a large suburban greenhouse and woodlot. The Department has close association with the University's Marine Science Institute at Nahant and with the University's Electron Microscopy Center.

Description of Minor A minor in Biology consists of any six 18.— courses for which the student has the prerequisites, plus two more courses, which may be 18.— courses or courses from other departments that serve as prerequisites for Biology courses. At least five of the total eight courses must include laboratory, and a student may not count toward the Biology minor more than one course, or course sequence, that covers substantially the same material (examples of such duplication would be 18.114–115 and 18.116 and 18.143–144–148, or 18.111–113 and 18.131–133).

To accommodate the needs of students majoring in many different fields, the Biology minor requirements have been phrased in a very general and flexible way. To ensure that course selection is sound and appropriate to the student's background, *each student's Biology minor program must receive the signed approval of the Biology minors' adviser.* The student should obtain this required approval of his/her program before the start or, at the latest, by the end of the first Biology course. Failure to do so may result in courses' not being counted for a minor, if the adviser finds them to have been inappropriate selections.

The academic standards for a minor in Biology are the same as those for a Biology major; namely, a QPA of 2.000 must be achieved for those courses used to satisfy the minor requirements. Courses taken on a pass/fail basis are not acceptable for minor credit.

Suggested course groupings for a Biology minor have been developed for students with different backgrounds in college mathematics and science. The "core" minor for students with considerable course work in mathematics, chemistry, or physics provides the basic foundation on which a Biology major is built, without advanced specialization. For students with less or no college mathematics/science background, three other minor options provide the opportunity for first-level exposure to the basic principles of Biology, plus an opportunity to achieve some advanced specialization in plant and/or animal studies or to explore human biology and the problems of the environment. For further information, consult the Biology minors' adviser.



Chemistry Department

Philip W. Le Quesne, Ph.D., D.Sci., *Professor and Chairman*

Professors

Geoffrey Davies, Ph.D.
Bill C. Giessen, Dr.Sc.Nat.
Arthur M. Halpern, Ph.D.
Barry L. Karger, Ph.D.
John L. Neumeyer, Ph.D.
Robert F. Raffauf, Ph.D.
William M. Reiff, Ph.D.
Robert A. Shepard, Ph.D.
Alfred Viola, Ph.D.
Karl Weiss, Ph.D.

Assistant Professors

David A. Forsyth, Ph.D.
Thomas R. Gilbert, Ph.D.
Michael E. Kellman, Ph.D.
Kay D. Onan, Ph.D.
Mary J. Ondrechen, Ph.D.

Instructors

James F. Hall, Jr., M.S.
Bernard J. Lemire, B.S.,
Supervisor of Laboratories

Associate Professors

David M. Howell, Ph.D.
Conrad M. Jankowski, Ph.D.
Elmer E. Jones, Ph.D.
John L. Roebber, Ph.D.
Efthalia J. Spinos, M.S.
Paul Vouros, Ph.D.
Robert N. Weiner, Ph.D.



Professional Preparation

Aims The educational objectives of the Chemistry Department are to give students the opportunity to: 1) experience the intellectual stimulation of studying a physical science; 2) grasp the basic principles and techniques that are central to a variety of chemistry-related careers; and 3) prepare for graduate study in chemistry or related fields. These objectives are implemented by the Department's highly research-oriented faculty, including experts in various fields of the science.

Description of Major Chemistry is concerned with the structure and properties of substances and with the transformations they undergo. The boundaries between the classical areas of analytical, inorganic, organic, and physical chemistry are no longer distinct. Moreover, significant overlaps have developed between chemistry and the fields of biology, physics, mathematics, medicine, and engineering. These trends are reflected in the Chemistry major programs at Northeastern.

Modern chemistry is the cornerstone for a large number of professions and industries. Challenging career opportunities exist in almost all technical fields in which functions such as research, development, production, sales, market analysis, quality control, and management are involved. *The Chemistry major programs offer the students an excellent opportunity for preparation in the study of medicine, dentistry, and for advanced study in many fields of science.* For students who choose to participate in the Cooperative Plan of Education there can be additional professional benefits. The practical experience gained on a job places chemistry in a more realistic perspective than does academic training alone and may help students to better prepare themselves for better employment prospects upon graduation.

The Department publishes an informational booklet, *Chemistry at Northeastern*, which describes the Chemistry major curriculum and requirements in detail. Interested students may obtain a copy of this booklet in the main office of the Chemistry Department, Room 102, Hurtig Hall or from the Department of Admissions, 150 Richards Hall.

A View of the Major The Department offers two major programs that lead to the B.S. or B.A. degree. Both are based normally on the five-year cooperative-study plan, but academically equivalent four-year study options are available. The two degree curricula differ mainly in their arts and sciences content and advanced science course requirements. Departmental advisers are ready to provide assistance and counseling to all Chemistry majors in relation to course selections and other professional matters.

The Chemistry major programs at Northeastern are based on a novel, career-oriented concept. The basic core of courses in chemistry, mathematics, and physics may be supplemented with selected courses in other areas. Thus, the program offers the student an opportunity to prepare for any one of a wide variety of careers. Our alumni have pursued careers in many areas, such as:

- Technical employment in industry
- Chemical sales and management
- Teaching and research *via* graduate study
- Clinical chemistry, medicinal chemistry, and pharmaceutical chemistry
- Geochemistry, mineralogy, and environmental chemistry
- The health professions (medicine, dentistry)
- Forensic chemistry

Departmental advisers suggest various course options for students interested in preparing for any of the above careers. The variety of careers open to persons with strong backgrounds in chemistry is extensive, and other options can be constructed from the large number of courses offered at the University.

The core curriculum is common to all options. It consists of courses in English, calculus, physics, and basic chemistry, which are taken in the freshman year. Students may be exempt from the General Chemistry courses by passing equivalency tests; in this case other courses are substituted. In the upperclass years, students take courses in organic, inorganic, physical, and analytical chemistry. For the B.S. degree, some additional advanced mathematics and science courses are required. German or Russian is strongly recommended for students who plan to pursue graduate study in the sciences.

Qualified students are encouraged to undertake a research project under the supervision of a faculty member. An honors program is open to especially able students.

Chemistry Minor A minor program in Chemistry is available for students majoring in other fields. It consists of courses in general, analytical, organic, and physical chemistry. Further information may be obtained from the Chemistry Department Office, Room 102, Hurtig Hall.

Accreditation

The Chemistry programs at Northeastern are approved by the American Chemical Society. The B.S. degree meets the Society's requirements for certification, which means that a certified graduate is eligible for full membership in the A.C.S. after two years of experience.

Facilities and Research

The main facilities of the Chemistry Department are housed in Hurtig Hall, a modern, air-conditioned, five-story building that contains equipment for up-to-date teaching and research. All faculty offices are located there, as is the James Flack Norris Room, which serves as a lounge for undergraduate Chemistry majors. Additional research facilities are located in the Forsyth Building (Photochemistry and Spectroscopy Laboratory) and in the Institute of Chemical Analysis, Applications, and Forensic Science. The Department's major research equipment includes electron microscopes, a mass spectrometer, lasers, X-ray diffractometers, nuclear magnetic-resonance and electron spin-resonance spectrometers, Gouy and Faraday magnetic balances, photoelectron and Mossbauer spectrometers, and a variety of ultraviolet and infrared spectrometers. Undergraduate students taking advanced courses or working on research projects may utilize certain of these instruments.

Active research programs are under way in synthetic and mechanistic organic chemistry, natural products chemistry, inorganic chemistry, chemical oceanography, photochemistry and spectroscopy, analytical chemistry, separation science, and solid-state chemistry.

Drama Department

Sergei P. Tschernisch, M.F.A., *Professor and Acting Chairman*

Professor

Eugene J. Blackman, M.A.

Mort S. Kaplan, M.A.

Associate Professor

Jerrold A. Phillips, Ph.D.

Assistant Professor

Richard E. Schreiber, M.F.A.

Instructor

Ingrid H. Sonnichsen, M.A.

Janet L. Bobcean, M.F.A.

Technical Director

Russell Swift, B.F.A.



Professional Preparation

Aims Theatre, one of the most ancient of all art forms, is still a moving force in our society because it uniquely involves the spectator to a degree unmatched by most creative and communicative arts.

At Northeastern, students in Drama are offered the opportunity to prepare for careers in educational and professional theatre, as well as to prepare for advanced study at a graduate institution.

Description of Major The undergraduate Drama major will be introduced to the total theatre experience, as well as its individual arts and crafts.

Theatre history, dramatic literature, playwriting, as well as acting, directing, technical production, scene design, lighting design, costume design, voice control, and stage movement are only some of the areas covered in classroom courses. Theory will be tested in the theatre labora-

tries—the stages and their shops. Drama majors are encouraged to express individual creative and interpretive impulses in courses, laboratory classes, and with the working crews and casts of productions. Advanced students will be urged to demonstrate abilities in independently organized, but faculty-supervised, projects in acting, playwriting, criticism, directing, and design.

A View of the Major The difference between the B.A. degree and the B.S. degree is one of flexibility and concentration. The B.S. degree allows the substitution of specialized field courses for the usual College distribution and language requirements.

However, there are minimum requirements for both degrees, with sixty quarter hours to be taken in the major area. Thirty-two quarter hours are to include *Theatre History I and II*, *Stagecraft*, *Acting I*, *Dramatic Theory and Criticism*, *Directing I*, and *Practicum in Play Production*. Beyond these basic courses, a major selects and completes a minimum of twenty-eight quarter hours of advanced work within one of three tracks: Acting/Directing, Technical Theatre, or Playwriting/Dramatic Criticism/Theatre History.

The theatre represents the major public laboratory to the Drama major, a place where theory is put into practice. All majors are expected to work in production each quarter in residence and fulfill a variety of crew assignments in construction, painting, sound, lighting, sewing, and ticket selling, as well as crew assignments for the running of a show—wardrobe, makeup, props, scene shifting, ushering, and house managing. Whenever possible, majors are expected to serve as stage managers and assistant stage managers. Appearing in a production is not a substitute for crew work and, when reasonably possible, all those concentrating in a performance aspect should also participate in crew activities.

It is recommended that the Drama major have at least a basic familiarity with other creative arts as well as the basic humanities. When practicable, the major should take course work in the following areas outside the major field of concentration: music, art, philosophy, American and English literature.

It is also recommended that Drama majors take a Physical Education *skill* course during each of the quarters in residence. The following courses, when available, are recommended: Modern Dance, Ballet, Jazz Dance, Tumbling, Gymnastics, Judo, Boxing, Wrestling, Fencing, Weight Training, Physical Conditioning, Exercise and Physical Control, or Swimming.

A few places in upper-class performance courses are kept available for freshmen students.

Minor in Drama

Students majoring in other departments may choose a minor in Drama to complement their academic majors or to assist them in developing career goals by taking eight courses (thirty-two quarter hours). Closely supervised by a Drama faculty adviser, students may follow programs of study that offer a generalized or a specialized program. Specialized areas are in performance, technical theatre/design, and drama literature and criticism.

Accreditation

Basic course work offered by this Department adheres to the suggested minimum requirements for a Drama degree as put forth by the American Theatre Association and enables the diligent student to prepare for the Graduate Placement Examination in Theatre.

Earth Sciences Department

Richard S. Naylor, Ph.D., *Associate Professor and Chairman*

Associate Professors

Richard H. Bailey, Ph.D.
Bernard L. Gordon, M.S.
William A. Newman, Ph.D.
David L. Wilmarth, Ph.D.

Assistant Professors

Malcolm D. Hill, Ph.D.
Peter S. Rosen, Ph.D.
Martin E. Ross, Ph.D.

Professional Preparation

Aims The Department of Earth Sciences offers a degree program in geology as an in-depth study of a major area of the earth sciences, as well as courses in geology, oceanography, and astronomy, which are available to all students.

Description of Geology Major Geology is a broad-based science that deals with the study of the physical features, composition, history, and processes of the earth. The study of geology, however, also demands an understanding of the application of scientific knowledge to current problems and concerns. For example, the manufacture of an enormous number of products composed of metals and petroleum derivatives is a primary basis of the economy of our society. Understanding the origins of these natural resources and the ways in which to ensure their continued supply is, therefore, one of the major roles of today's geologists. Only a small portion of the earth has been studied in detail, leaving many unexplored frontiers for each new graduate in the field.

A View of the Major Since the study of geology utilizes principles of other physical sciences, students should complete basic courses in chemistry, physics, and mathematics along with Physical and Historical Geology during their first two years. After completing the introductory geology courses and one year of chemistry, every Geology major takes a three-course sequence—Descriptive Mineralogy, Optical Crystallography, and Optical Mineralogy—since a knowledge of minerals is fundamental to geological understanding. In addition to the required introductory and mineralogy courses, the student chooses a minimum of six (for the B.A. degree) or eight (for the B.S. degree) additional geology courses. There are also electives required in the areas of the humanities and social sciences.

Each student is assigned to an adviser in the Department. The adviser assists students in making appropriate course selections as their knowledge increases and special interests develop. Though not required, courses in petrology, structural geology, and paleontology are usually among the electives chosen by undergraduates.

During the junior and senior years, students may select undergraduate research as one of their elective courses. Under the supervision of a faculty member, a problem is selected, defined, and researched. These projects offer undergraduates the opportunity to go much more deeply into some aspect of geology that holds particular interest for them. Students who meet the college requirements for the honors program may also be invited to carry out an undergraduate research project.

In addition to its major curriculum the Earth Sciences Department also offers a minor program in Geology.

Special Information

Field Trips Though much geology can be learned from textbooks and in the laboratory, a sound geological education must also include first-hand experience in the field and direct observation of geological phenomena. Whenever it is appropriate, field work on an individual or group basis will be part of courses.

Economics Department

Morris A. Horowitz, Ph.D., *Professor and Chairman*

Professors

Conrad P. Caligaris, Ph.D.
Harold M. Goldstein, Ph.D.
Daryl A. Hellman, Ph.D.
Irwin L. Herrnsstadt, Ph.D.
Sungwoo Kim, Ph.D.
Gustav Schachter, Ph.D.
Donald Shelby, Ph.D.

Associate Professors

Ernest M. DeCicco, Ph.D.
Pawan K. Sawhney, Ph.D.
Andrew M. Sum, M.A.

Assistant Professors

Neil O. Alper, Ph.D.
Ranko Bon, Ph.D.
Kamran N. Dadkhah, Ph.D.
Barbara M. Fraumeni, Ph.D.
Jeanne K. Henn, Ph.D.
Steven A. Morrison, Ph.D.
Edward P. Shea, Ph.D.
Gregory Wassall, Ph.D.

Instructors

Maria N. DaCosta, M.A.
Meenakshi N. Dalal, M.A.
Charles W. Harrington, M.A.
Bruce L. Kutnick, M.A.
James W. McKinsey, M.A.
Ramaswami Murali, M.B.A.
Donna E. Olszewski, M.A.
Manijeh Sabi, M.A.
Ahmad Saranjampour, M.A.
Frank Tortora, M.A.
Prajapati Trivedi, M.S.

Professional Preparation

Aims The Economics program offers students the opportunity to obtain a better understanding of how our economy and other economies function; to prepare themselves for graduate study in economics; and to develop specialties that may qualify them to work as economists.

Description of Major Economics is the study of ways in which scarce resources, including human resources, are deployed to satisfy the material wants of individuals and society. Economists analyze the factors that determine the success or failure of this process.

Macroeconomics, concerned with the overall economy, deals with such problems as inflation, unemployment, growth and instability, and government monetary, fiscal, and regulatory policies. Microeconomics is concerned with the economic behavior of individuals, households, firms, and industries. It assesses the economic effects of racism, sexism, pollu-

tion, and environmental damage and analyzes the economic aspects of natural resources, poverty, health, income distribution, trade unions, and collective bargaining.

Graduates are employed by businesses in such activities as industrial relations, planning and forecasting, determining plant locations, and making financial studies. They may become expert in analyzing consumer demand and developing and marketing new products. They may conduct research, teach, or provide specialized consulting services. In addition, federal, state, local governments, and trade unions are important sources of jobs for economists.

A baccalaureate economics degree, or graduation with a number of advanced economics courses, offers students an excellent opportunity to prepare themselves for graduate programs in economics as well as for entry into schools of law and business.

A View of the Major There is considerable flexibility in the Economics program to enable students to concentrate in areas of personal interest. A student expecting to major in the field should take the problem-oriented Principles of Economics in the freshman or sophomore year to discover the range of insights economics can offer in analyzing and solving a variety of problems. Upper-division courses apply theory to an in-depth study of a specific area of the field.

Other courses for the major include two quarters each of fundamentals of mathematics, economic statistics, and economic theory. In addition, the Department offers electives in all areas of economics, honors courses, reading courses, and a senior seminar.

The courses listed above are required for either the Bachelor of Arts or Bachelor of Science degree. However, the B.A. follows the liberal arts tradition in its distribution and language requirements—the Department of Economics requires other social science courses as well, plus six economics electives. The B.S. is a professional degree. In addition to social science electives, it requires ten economics electives and one course in quantitative methods.

The Department courses offer training in economic theory, money and banking, public finance, international trade, growth and development, industrial organization, comparative economic systems, economic history, environmental economics, economics of crime, urban problems, labor markets, collective bargaining, human resources, poverty and discrimination, and medical economics. In addition, tool courses, such as statistics, mathematical economics, econometrics, and quantitative methods are available. Other electives and readings courses permit a student to study an area in depth.

Description of Minor The Department also offers a minor consisting of four required courses and four electives, which are selected in consultation with a faculty adviser. Any course taken outside the Department of Economics to satisfy these minor elective requirements must be approved by a faculty adviser in the Department.

English Department

Kinley E. Roby, Ph.D., *Professor and Chairperson*

Professors

Richard Astro, Ph.D.
 Samuel J. Bernstein, Ph.D.
 Robert J. Blanch, Ph.D.
 Earl N. Harbert, Ph.D.
 Victor E. Howes, Ph.D.
 M. X. Lesser, Ph.D.
 Samuel F. Morse, Ph.D.
 James E. Nagel, Ph.D.
 Jane A. Nelson, Ph.D.
 Herbert L. Sussman, Ph.D.
 Arthur J. Weitzman, Ph.D.
 Paul C. Wermuth, Ph.D.

Associate Professors

Francis C. Blessington, Ph.D.
 Timothy R. Donovan, Ph.D.
 Irene Fairley, Ph.D.
 Daniel Golden, Ph.D.
 Gary Goshgarian, Ph.D.
 Gerald R. Griffin, Ph.D.
 Stuart S. Peterfreund, Ph.D.
 Guy Rotella, Ph.D.
 Lloyd A. Skiffington, Ph.D.
 Joseph E. Westlund, Ph.D.

Assistant Professors

Richard Bullock, Ph.D.
 Helen Loeb, Ph.D.
 Ruth K. MacDonald, Ph.D.

Instructors

James Cahalan, M.A.
 Nadia Coiner, M.A.
 Istvan Csicsery-Ronay, Ph.D.
 Elizabeth Deis, M.A.
 Richard Finkelstein, M.A.
 Lowell Frye, M.A.
 Joseph Litvak, M.A.
 John Nania, M.A.
 Michael Pownall, M.A.
 Michele Souda, M.A.

Continuing Instructors

Joseph B. DeRoche, M.F.A.
 David Tutein, M.A.

Continuing Lecturers

Maureen Godino, M.A.
 Susan Goldwitz, M.A.
 Eleanor Holstein, M.A.

Professional Preparation



Aims The English Department curriculum is diverse in its aims and flexible in its design. For the general University community, the curriculum offers possibilities in creative, expository, and technical writing; linguistics; and American, English, and foreign literature. For the preprofessional student—in law, medicine, business, or engineering—it offers a broad intellectual and cultural frame for specialist concerns. For the minor in English, it offers the possibility of concentration in literature or writing to supplement the major concerns of other disciplines. For the major in English, it offers the opportunity to prepare for careers in teaching and research, advertising and publishing, radio and television—indeed, any field in which communication and judgment go hand in hand.

At a time when the price of imprecision in language is more than simple misunderstanding and the cost of changing values more than personal uncertainty, the study of literature provides “a momentary stay against confusion.” It deals with the hard edge of being, an insight into the ways of men and women, at once clear and complex. In fact, the very structure of literature gives shape and meaning to the often formless experiences of life. And it does so with grace and force. Put another way, literature “tells it like it is,” not statistically, not abstractly, but with the details of fully realized people in accessible worlds, in “imaginary gardens with real toads in them.”

Description of Major There is flexibility enough in the curriculum requirements and its details to accommodate the pace and interest of a wide range of students. Members of the Department are available throughout the year to help and advise students, but the critical choice rests essentially with the student. So, too, is the choice within areas. The American literature requirement, for example, may be met by successfully completing courses from among such recent offerings as Major American Novels, The New England Renaissance, American Realism, and American Romanticism. To this area, as to others, the Department regularly adds new courses and, hence, even more options.

A View of the Major The curriculum for the major in English allows the student to take a wide variety of courses while maintaining a strong background in the history of British and American literature. After completing the freshman requirement, the English major takes survey courses, area courses (in language or writing, British literature, American literature, major figure, genre), other electives, and, finally, a Junior-Senior Seminar as the culmination of study. A student has the opportunity to study science fiction, Kurt Vonnegut, topics in film, or children's literature, as well as Shakespeare, early American literature, Romantic poetry, and topics in literary criticism. In an effort to be responsive to the individual interests and academic needs of a particular student, independent study also may be arranged with an English instructor.

A View of the Minor Students who would like to minor in English may choose either the minor in literature or the minor in writing. Within each minor, the student may select an individual course of study with the help of an English Department adviser. In the minor in writing, for example, the student may focus on creative, expository, or technical writing.

History Department

Raymond H. Robinson, Ph.D., *Professor and Chairman*

Professors

Philip N. Backstrom, Ph.D.
Ballard C. Campbell, Ph.D.
William M. Fowler, Jr., Ph.D.
Donald M. Jacobs, Ph.D.
John D. Post, Ph.D.

Assistant Professors

Laura L. Frader, Ph.D.
Ruth-Ann M. Harris, Ph.D.
Gerald H. Herman, M.A.
Martin R. Ring, Ph.D.

Associate Professors

Charmarie J. Blaisdell, Ph.D.
Norbert L. Fullington, Ph.D.
LaVerne J. Kuhnke, Ph.D.
Clay McShane, Ph.D.
Stanley R. Stembridge, Ph.D.

Professional Preparation

Aims History's concern with man in his diverse and complex past provides excellent opportunity for the development of greater understanding and appreciation of today's culture and civilization. Traditionally, history has been a major of great appeal to men and women desiring a

broad base before they embark on careers in business, law, journalism, and government.

Other majors know that they want to work more directly in history. Some want to teach in public schools. They may elect education courses which may lead to the opportunity to obtain state certification. (Those desiring jobs in private secondary schools need not be certified by state authorities.) Teaching positions in colleges and universities require master's, and increasingly doctor's, degrees. An undergraduate major in History facilitates entrance to graduate programs in the field. Ordinarily, college and university history teachers spend part of their time in research and writing.

Not all professional historians teach and write. Many find pleasure and profit working in public archives, private historical societies, museums, and restoration projects. Their careers serve not only other professional historians but a larger public as well.

Description of Major For majors of such diverse interests and ambitions, curricula must combine sensible structure with flexibility. Majors in History at Northeastern may qualify for either a Bachelor of Arts or a Bachelor of Science degree. Since the B.A. requires a foreign language, it appeals to prospective candidates for graduate school where reading knowledge of foreign languages is often necessary; the B.S. is designed for students desiring greater specialization in history and a social science orientation.

Candidates for both degrees are required to take the surveys in Western Civilization and American History, and The Historian's Craft, which focuses on methods, problems, and philosophies of historians. Beyond the basic courses is a wide range of offerings covering the political, economic, social, and cultural history of man in diverse times and places.

A View of the Major To ensure a broad program of study, the College of Arts and Sciences requires that students choose courses offered by departments outside the area of the major. Because history is classified as a social science, History majors must complete forty quarter hours of work in the humanities and science/mathematics (see page 38). Sixty quarter hours of history are required for the B.A. degree; seventy-two quarter hours for the B.S. degree.

The history requirements are broken into groups: Group A (Ancient, Medieval, and Early Modern Europe); Group B (Modern Europe); Group C (British North American Colonies and the United States); and Group D (Other Areas or Regions). A minimum of two courses (eight quarter hours) must be elected from each group.

Majors are also urged to avoid overspecialization at the undergraduate level. Though there are no maximum limits on the amount of history that may be taken, the Department advises broad course selection as the best policy for its majors. All majors are assigned to departmental advisers who offer counsel about the program. Students are urged to seek advice about history electives, about other electives, and about the honors program.

All qualified History majors are urged to consider the honors program in History. Those accepted write honors theses under the direction of members of the Department. Students ordinarily register for honors courses in their last three quarters of enrollment, except for the summer quarter when honors courses are not usually offered.

The Minor Students interested in a minor in history should consult the History Department for information.

Human Services

An interdisciplinary major involving the College of Arts and Sciences and the Boston-Bouv  College of Human Development Professions

Susan E. Massenzio, Ph.D., *Program Director*

Advisers

Eva Havas, Ph.D., *Sociology/Anthropology*
 John D. Herzog, Ph.D., *Foundations of Education*
 Wilfred E. Holton, Ph.D., *Sociology/Anthropology*
 Ronald J. McAllister, Ph.D., *Sociology/Anthropology*
 Marlene MacLeish, Ed.D., *Sociology/Anthropology*
 Alvin Zalinger, M.A., *Foundations of Education*
 Harold S. Zamansky, Ph.D., *Psychology*

Fieldwork Supervisor

Natalie H. Riffin, M.Ed., O.T.R.

Human Services

Aims This major offers students the opportunity to prepare themselves for possible careers in one of the areas broadly defined as "human services." The program is interdisciplinary. The Human Services curriculum allows students the opportunity to obtain fundamental attitudes, knowledge, and skills that may lead to meaningful careers in the helping professions as well as to graduate education in a variety of fields.

Students who major in Human Services through the College of Arts and Sciences may prepare themselves to perform a variety of functions in public and private agencies. Through course work, two quarters of fieldwork experience, and possible co-op jobs, students have the opportunity to explore such areas as: casework services in social service and welfare agencies; therapeutic treatment programs in mental health settings; supportive counseling in community health centers; rehabilitation counseling services; sheltered workshops; parole counseling; court liaison in programs for delinquent youth; staff work in half-way houses, penal institutions, and drug treatment centers; supportive counseling for the mentally retarded; community organizing; services for the aging; administration in human services agencies; and social program research and evaluation.

Description of the Major The Human Services program offers a continuing advisory system to help students make the best use of their early course selections and to guide them to appropriate upper-level courses.

College Requirements. Degree requirements differ for each participating college. Refer to pages 38 to 39 for requirements in the College of Arts and Sciences and to page 91 for requirements in the Boston-Bouv  College of Human Development Professions. Degree candidates in Human Services in Arts and Sciences are required to meet the modern language and distribution requirements of the College (see pages 38 and 39). Students in Arts and Sciences may take a five-year Cooperative Education Program or a four-year full-time program.

There are five basic aspects to the program as follows:

1. **Prerequisite Courses.** Prescribed courses in sociology, psychology, government, economics, and human services are required, for a total of six courses.

2. Core Courses. Nine courses in such areas as statistics, research methods, group process, organizations, personality, intervention strategies, and a senior seminar are required as "core" courses.
3. Specified Electives. Three courses in the areas of Afro-American Studies, special education, and/or poverty must be selected from a list of recommended options.
4. Specialization. Each student must take a five-course specialization developed in conjunction with an adviser. Typically, these specializations are in one of three areas: administrative, community, and clinical. Specific course choices are designed to complement the individual's interests and goals.
5. Fieldwork. Human Services students are required to fulfill two fieldwork placements during the last two years of their program. Each placement consists of 150 hours on site. The type of placement varies according to the student's interest. In the past, students have found placements in community centers, nursing homes, vocational workshops, state and federal agencies for children, and recreational facilities. These experiences are supervised by University staff to maximize the student's learning opportunity.

A View of the Major The Human Services major offers students the opportunity to obtain useful values and basic knowledge relating to various human services fields. Courses introducing some basic skills can help them to understand and work with a variety of helping services.

Human Services students at Northeastern have been very active in their major and helpful to each other. The Human Services Student Organization combines social and career-related activities, which in the past have included open houses, day-long conferences, and weekend retreats. A quarterly *Human Services Newsletter* is published by students and faculty.

For specific details on degree requirements, students should consult their Human Services advisers or the Program Director in 202 Lake Hall.

Journalism Department

LaRue W. Gilleland, M.A.J., *Professor and Chairman*
E. Wallace Coyle, Ph.D., *Executive Officer*

Associate Professor

William Kirtz, M.S.

Assistant Professors

Jane Bick, M.A.

Patricia Hastings, Ph.D.

Carole Lindell Hoyt, M.A.

Lecturer

Louis E. Conrad, B.J.

Professional Preparation

Aims In this complex world, society relies increasingly on the mass media to keep abreast of rapidly changing conditions. It is the role of the journalist to observe, report, analyze, and interpret, as well as provide leadership through the media's many outlets.

Career Opportunities Many opportunities exist in the broad field of journalism and mass communications. Most Northeastern University journalism graduates work for daily and weekly newspapers, news departments of radio and television stations, wire services, general and specialized magazines, public relations departments, and advertising agencies. Also, Northeastern graduates have found that a journalism education offers an excellent background for many nonmedia fields where the communication process is important.

A View of the Major A journalist should have a broad background of liberal arts courses on the undergraduate level, a need that most university journalism programs have long recognized. The student should have professional courses but not to the point of overspecialization.

The generally accepted formula for the bachelor's degree in journalism is a combination of 75 percent arts and sciences courses and 25 percent professional courses. The ideal schedule is one or two journalism courses each quarter, with additional work in the humanities, social sciences, physical sciences, economics, and business.

Because journalism skills can be better expanded and understood with the aid of a laboratory, upperclass journalism majors are encouraged to participate in the Cooperative Plan of Education. Co-op assignments with newspapers, radio and television stations, news bureaus, advertising agencies, and public relations offices provide a laboratory experience important in offering students the opportunity to prepare themselves for careers in mass communications. In addition, such experience offers the student an advantage if he or she decides to seek admission to a graduate program in journalism.

All majors in this department complete a journalism core program that includes History of Journalism, Journalism Ethics, Newswriting, Editing, Law of the Press, and Photojournalism. In addition, each major takes courses in one of four concentrations—Newspaper/Print Media, Radio-Television News, Advertising, or Public Relations—according to his or her career objectives.



Linguistics

An interdepartmental major

François Grosjean, Ph.D. and Doctorat d'Etat, *Associate Professor and Coordinator, Psychology*

Professor

Harlan Lane, Ph.D. and Doctorat d'Etat, *Psychology*

Associate Professors

Irene Fairley, Ph.D., *English*

Michael Lipton, Ph.D., *Philosophy and Religion*

Joanne Miller, Ph.D., *Psychology*

Assistant Professors

Paul Dredge, Ph.D., *Sociology/Anthropology*

Ross Hall, Ph.D., *Modern Languages*

Judy Shepard-Kegl, M.A., *Psychology*

Professional Preparation

Aims Linguistics is concerned with every aspect of language: for instance, how children learn to speak, how we understand and produce language, how language barriers keep people apart and how language ties bring them together, how language is structured and how it is represented in the brain, why some people are better at acquiring a second language than others, and how sign languages are different from spoken languages. A major in linguistics may be a useful first step in becoming, for instance, a linguist, an expert on child language, a teacher of a foreign language or of English as a second language, an interpreter, or even an expert in artificial intelligence. But above all, specializing in linguistics allows the student an opportunity to have an insight into language itself—a highly complex aspect of our everyday life that we take for granted far too readily.

Description of Major The major in linguistics is an interdepartmental enterprise. Five departments (English, Modern Languages, Philosophy and Religion, Psychology, and Sociology/Anthropology) collaborate to offer a comprehensive program that makes use of the vast resources and talent that exist at Northeastern University in the field of linguistics. The major reflects the current research of such diverse people as linguists, sociologists, psychologists, language educators, and teachers of second languages. It is administered by a coordinator who is a member of the Psychology Department.

The major offers students a systematic introduction to modern linguistics and is broad enough to meet the needs of students interested in:

- general linguistics (phonetics and phonology, semantics, syntax, bilingualism, historical linguistics, philosophy of language, language and culture, American Sign Language);
- experimental linguistics (language and cognition, child language, neurolinguistics, psycholinguistics); and
- linguistics applied to language-related work (language teaching, language testing, language teaching materials, interpreting, literary analysis).

A View of the Major Students enrolled in the major can obtain either a Bachelor of Arts or a Bachelor of Science degree. These two degrees are in every way identical except that the second language requirement can be met with American Sign Language in the B.S. degree but not in the B.A. degree.

The major includes freshman and distribution requirements in sciences, mathematics, social sciences, and the humanities. The general requirements of the major include six basic courses from the main areas of linguistics: general linguistics, psycholinguistics, sociolinguistics, and applied linguistics. Students also take five additional courses in the area of their choice. These courses include, among others, Bilingualism, Child Language, Philosophy of Language, Linguistics of American Sign Language, Neurolinguistics, Transformational Grammar, Body Language, Animal Communication, Introduction to Semantics, and Symbolic Logic.

All students also take a laboratory course in which they are introduced to language research in a laboratory environment. Two advanced seminars are required as is a practicum that can take the form of fieldwork, interpreting, language teaching, or a directed study. The practicum is supervised by a faculty member who advises the student and monitors his/her progress. Advanced knowledge of a second language—spoken or sign—is required, by either taking appropriate courses or demonstrating proficiency in that language.

The program is suitable for those students interested in teaching American Sign Language. They may wish to concentrate on the applied linguistics of sign language while working on their bachelor's degree. This concentration enables students to acquire the background and the skills necessary to become professional teachers of sign language and helps them prepare for the sign language instructor certification.

Throughout the course of study, students meet regularly with an adviser who helps them plan their course work and advises them on all aspects of the major.

Research The students enrolled in a directed-study course and in the laboratory course will take advantage of the Psychology Department's two language laboratories, which contain audio and video recording facilities and a computer for stimulus preparation, data gathering, and statistical analysis. They will work with graduate students, research assistants, and faculty on ongoing projects related to the perception and production of spoken and sign languages.

A brochure describing the linguistics major, as well as additional information, can be obtained from Professors F. Grosjean or J. Shepard-Kegl, Department of Psychology, 282 Nightingale Hall.

Minor in Linguistics In addition to the major, the linguistics program offers students specializing in other disciplines a minor in linguistics. This minor is designed to give students the opportunity to broaden their field of study and to enhance their career opportunities. The minor consists of eight courses, three required courses with the remainder selected from a large set of courses offered by the program. Students minoring in linguistics are assigned a faculty adviser to help them select the courses that best suit their needs.

A brochure describing the linguistics minor, as well as additional information, can be obtained from Professors F. Grosjean or J. Shepard-Kegl, Department of Psychology, 282 Nightingale Hall.

Mathematics Department

Maurice E. Gilmore, Ph.D., *Professor and Chairman*

Professors

Samuel J. Blank, Ph.D.
 Bohumil Cenk, Sc.D.
 David I. Epstein, Ph.D.
 Holland C. Filgo, Ph.D.
 Alberto R. Galmarino, Ph.D.
 Arshag B. Hajian, Ph.D.
 Nancy Kopell, Ph.D.
 Richard A. Rasala, Ph.D.
 Jayant Shah, Ph.D.
 Gabriel Stolzenberg, Ph.D.
 Harold L. Stubbs, Ph.D., *Robert
 G. Shore Professor of
 Mathematics*
 Jack Warga, Ph.D.

Associate Professors

Shirley A. Blackett, M.Ed.
 Mark Bridger, Ph.D.
 Gail Carpenter, Ph.D.
 Bruce Claflin, M.S.
 Ellen H. Dunlap, B.A.
 Harriet Fell, Ph.D.
 John Frampton, Ph.D.
 Samuel M. Giveen, M.A.
 Eugene Gover, Ph.D.
 Anthony Iarrobino, Ph.D.
 Nishan Krikorian, Ph.D.
 Richard Porter, Ph.D.
 Mark Ramras, Ph.D.

Betty Salzberg, Ph.D.
 Thomas O. Sherman, Ph.D.
 Victor R. Staknis, Ph.D.

Assistant Professors

John J. Cade, Ph.D.
 Robert W. Case, Ph.D.
 Agnes H. Chan, Ph.D.
 Margaret B. Cozzens, Ph.D.
 Leonore Feigenbaum, Ph.D.
 Terence J. Gaffney, Ph.D.
 Laurence S. Gillick, Ph.D.
 Mark Goresky, Ph.D.
 J. Joseph Guay, Ph.D.
 Samuel Gutmann, Ph.D.
 John C. Henze, Ph.D.
 Paul R. Holley, M.S.
 Solomon M. Jekel, Ph.D.
 Donald R. King, Ph.D.
 Miroslav I. Klun, Ph.D.
 Robert C. McOwen, Ph.D.
 Michael Perloff, Ph.D.
 Vera K. Proulx, Ph.D.
 Catherine M. Roche, Ph.D.
 Martin Schwarz, Ph.D.
 Nevin B. Schrimshaw, Ph.D.
 William K. Stevens, Ph.D.
 Mark D. Stewart, Ph.D.
 Gordana G. Todorov, Ph.D.
 Michael Weiss, Ph.D.

Professional Preparation

Aims The Department offers interested students the opportunity to develop and expand their abilities in this exact science, one of the oldest and most basic of all the sciences.

Description of Major The Department offers two programs of study in mathematics. One of the programs in mathematics leads to a Bachelor of Arts degree and requires a minimum of thirteen mathematics courses. Students in the Bachelor of Arts program also must complete a foreign language requirement. Because mathematics-related material is more often written in French, German, Italian, or Russian, one of these languages is recommended. The Department also offers a Bachelor of Science degree program, which requires a minimum of sixteen mathematics courses but does not require the study of a foreign language.

A View of the Major All students must take a basic sequence of mathematics courses, which, as a rule, should be completed by the end of the sophomore year. The sequence offers students the opportunity to acquire a working knowledge of the calculus of one and several variables, differential equations, some linear algebra, and numerical methods. With respect to the latter, although a computer programming course is not required, students will be encouraged and eventually expected to learn the basic programming skills necessary for numerical solutions of complex problems. Mathematical computer science courses are offered for interested first- and second-year students.

A transition from the basic sequence to more advanced parts of the curriculum is provided by Analysis I-II and Advanced Linear Algebra I. These courses are prerequisites for many advanced courses in applied analysis, complex analysis, topology, and foundations. In computer science, the courses in computer organization and information structures are the link to more advanced subjects.

As a rule, students planning to take a substantial number of mathematics courses (e.g., two per quarter) should take Analysis I-II and Advanced Linear Algebra I in the middler year. Students may wish to take a prerequisite for more advanced courses in algebra and/or one that includes linear, nonlinear, and dynamic programming. Courses in probability, statistics, and numerical analysis may also be taken directly after the basic sequence.

Computer Science Minor

For students who major in other areas but are interested in learning about computers and computer programming, the Department offers a minor in Computer Science. The program contains four basic courses and a wide range of electives to accommodate individual needs.

To qualify for this minor, a student must take twenty-eight quarter hours, including the four basic courses and three advanced mathematics and computer science courses listed by the Department.

Modern Languages Department

Holbrook C. Robinson, Ph.D., *Associate Professor and Chairman*

Israel A. Aluf, Ph.D., *Associate Professor and Executive Officer*

Professor

Samuel Jaramillo, Ph.D.

Associate Professors

Lillian Bulwa, Ph.D.

Benedetto Fabrizi, D.M.L.

Juliette M. Gilman, Ph.D.

Bonnie S. McSorley, Ph.D.

Constance H. Rose, Ph.D.

Philip H. Stephan, Ph.D.

Assistant Professors

Walter M. Gershuny, Ph.D.

Ross D. Hall, Ph.D.

Robert B. Modee, M.A.

Stephen A. Sadow, Ph.D.

John Spiegel, M.A.

Mary-Anne Vetterling, Ph.D.

Instructor

Daniel C. Barker, M.A.

Professional Preparation

Aims The study of Modern Languages can be of value to all students, regardless of their major fields of interest. In the complex and rapid pace of modern life, there is a need for increased communication between varied and often divergent cultures, even those within the narrow confines of your own community. To better understand and appreciate these cultures, it is very important to know the ways in which the members of the culture think.

As the principal means of communication, language frequently offers the key to understanding. Thus, language may serve to help you achieve a more cosmopolitan, open-minded, and sensitive view of the world.

The Department offers opportunities for background preparation for students interested in elementary, secondary school, or college teaching; international business relations; government service; journalism; library science; world affairs; travel; and community service (especially in Spanish-speaking areas). Those who wish to teach in college must plan on graduate study.

Description of Major Available in French, German, Italian, Russian, or Spanish, the major in Modern Languages normally requires advanced courses in two languages. The freshman year usually is considered a year to establish the basic foundation upon which the major will be formed. It should be utilized to fulfill as many general requirements as possible so that during the upperclass years more time can be devoted to the major discipline.

Normally the study of a second (minor) language begins in the second year. However, in exceptional cases, this pattern may be altered to permit students to begin their second language in the freshman year or, perhaps, postpone it to a later year. The Modern Language major should plan to take at least two language electives per quarter from the beginning of the second year. Again, of course, this pattern may be varied to fit the needs of the individual student.

It should be noted that the requirements indicated here for the major and minor languages are *minimum* requirements. When at all possible, a student is strongly encouraged to go beyond them, and even, perhaps, to pursue a third language.

The Department is currently designing a one-language major. Students are urged to consult their departmental advisers for further information concerning this program and other possible curriculum changes.

The Major The Department offers a choice of either a Bachelor of Arts or a Bachelor of Science degree. For either degree, the student must select a major as well as a minor language from French, German, Italian, Russian, or Spanish. Both degrees require Freshman English.

The B.A. is, of course, the traditional degree for this discipline. Candidates for the B.A. must satisfy the College distribution requirements for graduation and, in addition, must meet the departmental requirements in their major. These requirements are eight quarter hours in Western Civilization, eight additional quarter hours in history (any other history courses relevant to the major are acceptable), eight quarter hours of Survey of English Literature, a minimum of thirty-two quarter hours of advanced work in the major language, and eight quarter hours of advanced work in the minor language. Advanced work may be defined as any course beyond the intermediate level of the language.

The Bachelor of Science degree in Modern Languages differs from the B.A. primarily in its emphasis. Whereas the B.A. requires that the student satisfy the distribution requirements of the College of Arts and Sciences, the B.S. waives these requirements in favor of a much more concentrated program in the major area.

In addition, the candidate for the B.S. degree must complete eight quarter hours of Composition and Conversation in the major language and eight quarter hours of Composition and Conversation in the minor language. Candidates then must complete forty additional quarter hours of advanced work in the major language and sixteen additional quarter credits of advanced work in the minor.

The Department is currently designing a one-language major. Students are urged to consult their departmental advisers for further information concerning this program and other possible curriculum changes.

The Minor For students interested in acquiring proficiency in one foreign language as an adjunct to their major, the Department offers a minor in Modern Languages, open to students of all colleges. The details of the requirements for a minor vary slightly from language to language, but, in all cases, the student is required to take a total of six courses. Generally, two composition and conversation courses, a civilization course, and an introductory course in literature are required. The remaining courses are free electives drawn from advanced courses offered by the Department.

Students are urged to consult the Department adviser for further information about the minor.

Additional Information In the basic language courses, attendance in the language laboratory is required for two half-hour sessions per week. The facilities of the language laboratory are also available on an optional basis for advanced work. The Department lounge is available to Modern Language students. See page 89 for information on courses in American Sign Language.

Music Department

Herbert H. Silverman, Ed.D., *Professor and Acting Chairman*

Professors

Roland L. Nadeau, M.M.
Leo Snyder, M.M.

Associate Professors

Reginald Haché, A.D.
Joshua R. Jacobson, D.M.A.
David Sonnenschein, D.M.A.

Assistant Professors

Julia A. Griffin, Ph.D.
Matthew McGarrell, M.M.
Dennis H. Miller, D.M.A.

Instructor

Linda C. Ott, M.M.

Lecturers

Edmond J. Moussally, M.M.
Karen L. Pokross, Ed.M.

Professional Preparation

Aims The Department of Music offers a comprehensive number of courses for students with an interest in, or a desire to learn about, music. In addition, the Department also serves the musical and cultural needs of the University and its various colleges, providing a wide range of musical experiences for students and the University community, and emphasizing the aesthetic aspects of intelligent listening to, and learning about, our musical heritage.

Department of Music courses fall within several categories: basic music theory, music education, historical periods and national styles, individual composers and their music, the forms of music, basic appreciation (overview), and functional performance.

In addition, faculty direct student performance organizations, such as the Early Music Players, the N.U. Choral Society, the N.U. Symphony Orchestra, and the N.U. Bands.

Students from these performance groups, as well as the music faculty and artists from the community at large, participate in a program of more than sixty concerts each year, most of which are free and open to the public.

Commencing with the 1982 Fall Quarter, the College of Arts and Sciences is introducing a new Bachelor of Arts degree program in Music Literature designed for students interested in music who would like the opportunity to pursue a liberal arts curriculum.

The Music Literature program offers a broadly based general curriculum that allows students to do scholarly work in music. Students who select this major have the opportunity to prepare themselves for a wide variety of professions as well as for more advanced graduate study in the fields of musicology, music theory and composition, education, law, journalism, communication (radio and television), library science, and history.

In addition to the major program in Music Literature, the Music Department has established a minor program in music for degree candidates in the College of Arts and Sciences. The minor program allows students to complement their academic program by specializing in a second area of interest.

Philosophy and Religion Department

Michael R. Lipton, Ph.D., *Associate Professor and Chairman*

Professors

Walter L. Fogg, Ph.D.
Pavel Kovaly, Ph.D., C.Sc.

Assistant Professors

Bart K. Gruzalski, Ph.D.
Susan M. Setta, Ph.D.

Associate Professors

William J. DeAngelis, Ph.D.
Edward A. Hacker, Ph.D.
Stephen L. Nathanson, Ph.D.
Gordon E. Pruett, Ph.D.
Joseph H. Wellbank, Ph.D.

Professional Preparation

Aims Philosophy deals with a wide range of questions and issues generated by various aspects of human experience, by the beliefs and theories people hold, and by the practical problems human beings confront. Philosophy includes both questions and theories related to art, religion, morality, society, and natural and social sciences. Because of the breadth of its concerns, the study of philosophy provides a unique opportunity for students to examine their beliefs in many areas through critical reflection.

Through readings, discussion, and writing, philosophy students can encounter and examine questions concerning the nature and validity of religious beliefs, moral judgments, and scientific theories, as well as questions of values and social policy in such areas as law, medicine, and technology. In all these areas, analysis of issues and evaluation of arguments provide an opportunity to understand diverse claims to knowledge and areas of controversy.

The program includes courses that may help strengthen the student's work in other areas and provide an understanding of the methods and traditions of philosophical and religious thought. A major in Philosophy may also help a student to acquire a broad background in the humanities and to sharpen his or her critical abilities in preparation for graduate or professional study in many areas. Indeed, former Philosophy majors can be found in the most diverse of professional careers. For students majoring in another discipline, the Department offers a minor program, which can be a valuable supplement to most fields.

The program in Religion offers students the opportunity to acquire an understanding of religious experience, both as an individual response and within its social, historical, literary, and political context. Specific religions (Christian, Jewish, Hindu, etc.) are studied as well as the mythical and mystical dimensions of religious experience in general. The program strives to clarify the relation between the religious experience and other facets of human life that are the concern of both the liberal arts and the professions. Although a major is not offered in Religion, the program attempts to provide a basic introduction to religious studies. Both introductory and intermediate-level courses are offered.

Description of Major Northeastern's program for a Philosophy major is designed to offer students a balanced understanding of the nature of philosophy and particular philosophical problems that arise in the various arts and sciences. A maximum number of electives has been provided so that students may choose in accordance with their own backgrounds and interests. Students may pursue either a five-year cooperative or a four-year full-time course of study.

Although the departmental requirements for the B.A. degree are the same as those for the B.S., students taking the B.A. must meet the language and distribution requirements set by the College. All degree candidates in Philosophy must take at least eight quarter hours in English and fifty-two quarter hours in the Department and must meet the following specific requirements:

- A. Classical Greek Philosophy *and* Modern Philosophy
- B. Introduction to Logic *OR* Symbolic Logic (the Department emphatically recommends that students contemplating graduate studies in Philosophy take Symbolic Logic)
- C. Theory of Knowledge *OR* Metaphysics *OR* Moral Philosophy and
- D. At least one seminar
- E. Thirty-two quarter hours of Philosophy electives, to be selected after consultation with the student's departmental adviser

Description of Minor To attempt to meet the needs of students who are majoring in other areas but have a special interest in Philosophy, the Department offers a minor in Philosophy. The program contains an essential core of courses, as well as a great range of electives to accommodate individual interests.

Specific requirements:

- A. an introduction to philosophy course
- B. either Classical Greek Philosophy *OR* Modern Philosophy
- C. either Introductory Logic *OR* Symbolic Logic
- D. either Moral Philosophy *OR* Theory of Knowledge *OR* Metaphysics *OR* Philosophy of Mind
- E. Three electives in Philosophy to bring the total number of quarter hours in Philosophy to twenty-eight

Physics Department

Robert P. Lowndes, Ph.D., *Professor and Chairman*

Professors

Ronald Aaron, Ph.D.
 Petros N. Argyres, Ph.D.
 Richard L. Arnowitt, Ph.D.
 Alan H. Cromer, Ph.D.
 William L. Faissler, Ph.D.
 Marvin H. Friedman, Ph.D.
 David A. Garelick, Ph.D.
 Marvin W. Gettner, Ph.D.
 Michael J. Glaubman, Ph.D.
 Hyman Goldberg, Ph.D.
 Walter Hauser, Ph.D.
 Giovanni Lanza, Ph.D.
 Bertram J. Malenka, Ph.D.
 Pran Nath, Ph.D.
 Clive H. Perry, Ph.D.
 Eugene J. Saletan, Ph.D.
 Carl A. Shiffman, Ph.D.
 Jeffrey B. Sokoloff, Ph.D.
 Yogendra N. Srivastava, Ph.D.
 Michael T. Vaughn, Ph.D.
 Eberhard von Goeler, Ph.D.
 Roy Weinstein, Ph.D.
 Allan Widom, Ph.D.
 Fa Yueh Wu, Ph.D.

Associate Professors

Arun Bansil, Ph.D.
 Robert S. Markiewicz, Ph.D.
 Arthur W. Winston, Ph.D.
 (Visiting)

Assistant Professors

Laszlo Baksay, Ph.D.
 William N. Celmaster, Ph.D.
 John V. Chalupa, Ph.D.
 Ned S. Dixon, Ph.D.
 Linda S. Fritz, Ph.D. (Visiting)
 Krzysztof Jargocki, Ph.D. (Visiting)
 Jorge V. José, Ph.D.
 Marie E. Machacek, Ph.D.
 Stephen McKnight, Ph.D.
 Mark Novotny, Ph.D.
 Rajendra Prasad, Ph.D. (Visiting)
 W. Davis Shambroom, Ph.D.

Professional Preparation

Aims Physics is concerned with the fundamental principles that govern natural phenomena, ranging in scale from collisions of subatomic particles, through the behavior of solids and liquids, to exploding stars and colliding galaxies. Understanding these principles can help us understand basic chemical and biological processes, as well as the operation of engines, solid-state electronic devices, lasers, and other tools of modern civilization. The Physics Department offers undergraduate courses at four levels:

- 1) descriptive courses intended primarily for nonscience majors with limited mathematical background;
- 2) general survey courses intended for students in scientific and engineering fields;
- 3) advanced courses focusing on particular areas of physics and intended mainly, but not exclusively, for Physics majors; and
- 4) highly advanced courses intended mainly, but not exclusively, for graduate students in Physics.

Description of Major Students who major in Physics are offered the opportunity to prepare for a wide variety of careers. In addition to work in industrial and government laboratories in areas of applied physics, students who have mastered the fundamental principles emphasized in a physics education may find opportunities in allied fields, such as biophysics, geophysics, medical and radiation physics, and various branches of engineering.

A student majoring in Physics can follow either a four-year full-time program or a five-year co-op program. Many graduates have gone on to earn advanced degrees in physics and related fields.

A View of the Major Physics majors may study for either the Bachelor of Arts or Bachelor of Science degree.

Beyond the basic first- and second-year survey courses in physics and mathematics, B.A. candidates are required to pass three lecture and three laboratory courses in physics and one course in mathematics. The College requirements in English, modern language, humanities, and social science must also be satisfied. This program is extremely flexible and allows the B.A. Physics major to pursue other interests in depth.

Candidates for the B.S. must pass seven lecture and three laboratory courses in physics, two advanced courses in mathematics, and five technical electives (courses in science or engineering) beyond the basic physics and mathematics courses. The B.S. program is most appropriate for those students who wish to pursue graduate study in Physics.

The first-year program for all Physics majors includes a three-quarter physics course common to all science and math majors and a three-quarter mathematics course. The remaining two courses each quarter can be chosen from a wide range of electives. Two-quarter courses in physics and mathematics and a physics laboratory course in Electronics and Data Analysis are required in the second year.

The upperclass lecture courses offered by the Department include Mechanics, Wave Motion and Optics, Thermodynamics, Electromagnetic Theory, Quantum Theory, Mathematical Physics, Nuclear Physics, Solid State Physics, and Astrophysics. The upperclass laboratories include Wave Motion, Modern Physics, and Advanced Laboratory. These courses are taught by active researchers in physics who have a strong commitment to teaching, and the classes are generally small (ten to fifteen students).

There are special lectures sponsored by the Society of Physics Students and the Physics Club, as well as reading courses on special topics in physics.

Students interested in majoring in Physics should consult with one of the Department advisers as early as possible in their college careers to plan programs.

Description of Minor The Physics minor program is designed to accommodate a wide variety of interests while still providing a study of the fundamentals. To fulfill the requirements of the minor, a student must take three intermediate and/or advanced courses after completing Elementary Physics. Further information may be obtained from the Physics Department office, Room 109 Dana.

Honors Program and Undergraduate Research Students invited into the Honors Program may take graduate courses, reading courses, and special topics courses in the various research fields of the Department. Such work occasionally leads to presentation of papers at professional meetings and to publication in professional journals.

Political Science Department

Robert E. Gilbert, Ph.D., *Professor and Chairman*

Professors

Robert L. Cord, Ph.D.
David E. Schmitt, Ph.D.

Associate Professors

L. Gerald Bursey, Ph.D.
Minton F. Goldman, Ph.D.
Suzanne Ogden, Ph.D.
Steven Worth, Ph.D.

Assistant Professors

Stephen F. Coleman, Ph.D.
Malcolm Cross, Ph.D.

Duane L. Grimes, M.A.
Margaret E. Leahy, Ph.D.
Bruce M. Logan, Ph.D.
Eileen L. McDonagh, Ph.D.
Donald J. Reaves, Ph.D.
Stewart Reiser, Ph.D.

Instructors

David A. Rochefort, M.A.
Frank Schepps, M.B.A.

Professional Preparation

Aims Political science is concerned with the study of political institutions, the social and economic forces that shape them, the cultural context within which they operate, and human behavior in political matters.

The Department of Political Science at Northeastern University has three objectives: to offer students the opportunity to (1) obtain an education within the framework of the best liberal arts tradition; (2) help heighten their awareness of political forces in the environment and to sharpen their perception of their role as citizens in a democratic society; and (3) provide the opportunity for acquiring a solid academic foundation to those who elect political science, law, or public administration as a professional career.

Description of Major The study of political science can be the gateway to a liberal education with its benefits of broadened interests, sharpened sensibilities, and a quickened sense of civic responsibility. If you have a special interest in politics, studies in this field can help you prepare for governmental service, the study of law, the teaching of government and related subjects, or a career in politics or public management.

For the student who wishes to pursue professional studies at the graduate level, concentration in Political Science and Public Administration may help lead to many attractive opportunities. As in many fields, competition for positions is keen, so the student's success will depend upon such factors as academic record, experience, and personal initiative. There are some career opportunities in public management at the federal, state, and local levels of government, while positions in research are often available in government and university research bureaus. Teaching offers further career possibilities, as do specialized agencies in international bodies like the United Nations, which call for the skills of the political scientist. Individuals with specialized training in political science can compete for positions in less obvious areas: in the public-service programming of educational and commercial television, in journalism, and in legislative work and public relations activities with private associations.

A View of the Major Students may select either the Bachelor of Arts or the Bachelor of Science degree program. Students in the B.A. program have to meet the foreign language and distribution requirements of the College. Students in the B.S. program are required to take courses in Quantitative Analytical Methods. Both degrees require four quarter hours in each of the following: Introduction to Political Science, Introduction to American Government, Foreign Governments, International Relations, Public Administration, and Political Theory, as well as twenty-four to twenty-eight quarter hours of electives in political science and six electives (twenty-four quarter hours) in the social sciences, with at least one course in at least three of the following: African-American studies, anthropology, economics, history, psychology, or sociology. In addition, the B.S. student is required to take eight hours of research methods. Courses in basic math and FORTRAN and FORGO are also recommended for B.S. students.

Public Administration

The Bachelor of Science program with a concentration in Public Administration provides a third option for the student. This program requires the completion of forty hours of Introductory Political Science, American Government, Public Administration, Public Policy Analysis, Personnel Administration, Public Budgeting, and similar courses. Students must also complete at least sixteen quarter hours of Public Administration electives. Also, students may undertake a directed-study project based on an internship experience in a government agency. In addition, they must complete twenty-four hours of electives in the social sciences, at least eight of which should be in economics.

Description of the Minor A minor in Political Science is also available to interested students. It entails successfully completing seven political science courses, of which at least two must be from the following: Introduction to Politics, Introduction to American Government, Introduction to International Relations, Introduction to Foreign Governments, or Public Administration.



Psychology Department

Martin L. Block, Ph.D., *Associate Professor and Chairman*

Professors

John C. Armington, Ph.D.
 Harlan L. Lane, Ph.D., Doc. ès
 Lettres
 Helen S. Mahut, Ph.D.
 Bertram Scharf, Ph.D.
 Murray Sidman, Ph.D.
 Alexander A. Skavenski, Ph.D.
 Michael Terman, Ph.D.
 Harold S. Zamansky, Ph.D.

Associate Professors

Edward A. Arees, Ph.D.
 Roger Brightbill, Ph.D.
 Perrin S. Cohen, Ph.D.
 François Grosjean, Ph.D., Doc.
 ès Lettres
 Charles Karis, Ph.D.
 Harry Mackay, Ph.D.
 Joanne Miller, Ph.D.

Assistant Professors

Stephen Harkins, Ph.D.
 Judy Shepard-Kegl, M.A.

Clinical Associate Professors

Karen Geelen, Ph.D.
 Lawrence Stoddard, Ph.D.

Professional Preparation

Aims The undergraduate curriculum at Northeastern has been carefully designed to offer students the opportunity for an introduction to the scientific underpinnings of modern psychology, enabling them to make a sophisticated choice among opportunities for advanced work.

The field of psychology, broadly defined as the science of behavior, has grown so rapidly that students aiming for careers in the field must almost always anticipate advanced study in specialized areas beyond the bachelor's degree. The diversity of academic and professional activities that we label "psychology" today may be seen in the following sampling of divisions of the American Psychological Association: teaching, experimental, evaluation and measurement, physiological and comparative, developmental, personality and social, social issues, arts, clinical, consulting, industrial, educational, school, counseling, public service, military, adult development and aging, engineering, disability, consumer, philosophical, experimental analysis of behavior, history, community, psychopharmacology, psychotherapy, hypnosis. Thus, undergraduates preparing to be psychologists, or those who just want to learn more about the field, have set quite a goal for themselves!

Description of Major Our courses are not aimed merely at offering students the opportunity to prepare themselves for advanced training. They also reflect the personal and social concerns of today's undergraduates. For example, psychology recently has produced a new and powerful understanding of how environmental and physiological factors affect human behavior. It has developed methods that already have transformed profoundly individuals as well as society.

How do we evaluate this science and its technology? How do we ensure that researchers in psychology are free to investigate fully and that the technology is applied humanely to create a better life for all people?

These are only a few of the questions Northeastern undergraduates will be asking as they progress through a curriculum offering opportunities for laboratory practice and experimentation, field experiences in behavior technology, and small-group seminars to encourage critical and creative evaluation of psychology's accomplishments and its future.

Psychology explores many topics, such as the function of the brain in determining behavior; how we see, hear, and learn; what behavioral science can offer in the problem areas of mental retardation, personality problems, infancy, and old age; and how we might suggest social changes based on laboratory data to increase men's and women's accomplishments and satisfactions in the modern world.

A View of the Major The Department offers both a Bachelor of Arts and a Bachelor of Science degree. The B.S. degree is usually recommended for students with a strong scientific or professional interest who ultimately may consider applying to graduate schools in psychology or environmental science. In addition, the Department offers a special B.S. program for Psychology majors who wish to prepare for application to medical school. Since modern psychology is multidisciplinary, the B.A. and B.S. programs both include distribution requirements in allied sciences to fulfill the need for wide exposure to varying techniques of scientific practice and interpretation.

With the science courses and elementary psychology courses as foundations, students in the B.A. and B.S. programs may either pursue a general course of study in psychology or choose one of four major areas for concentration: Language and Cognition, Learning and Behavioral Analysis, Personality and Social, or Sensory and Neuropsychology. The curricula for the areas of concentration have been structured so that the student often takes courses not only in psychology, but also in related disciplines. For example, a student concentrating in Personality and Social takes courses in sociology, anthropology, and speech and drama. The student's final choice of concentration should be made only after personal consultation with his or her Psychology Department adviser.

Within each of the four concentrations, the student is expected to progress through a sequence of specialty courses, laboratory courses, and a seminar. The student is thus afforded the opportunity to explore a given area of psychology in depth, as well as to acquire an overview of the broader issues in psychology. Furthermore, all B.S. students and qualified B.A. students participate in the Department's Directed Studies Program, in which, under the direction of a faculty member, they engage in research projects in various laboratories in the Department. In this way, classroom learning is complemented by laboratory research, where the student may learn by doing.

Research Laboratories

The student who enrolls in laboratory courses and directed-study courses will take advantage of the Department's resources for research, which include: (a) in the field of learning, behavior laboratories for research with humans, monkeys, rats, and pigeons; and, in collaboration with the Walter E. Fernald State School, an instructional setting for research and training in behavior modification with retarded children and adults; (b) in neuropsychology and ethnology, primate and rodent surgeries in neuroanatomical and histological laboratories, with apparatus for stimulating and recording activities of the brain; (c) in the psychology

of vision and hearing, specialized enclosures and equipment for presenting visual and auditory stimuli and for measuring responses of the eye and the ear, including on-line computers; (d) in language and cognition, audio and video recording facilities and a computer for control of stimulus and response variables; and (e) in the field of personality, dark-rooms, tachistoscopes, and an eye-movement camera.

Minor in Psychology

Each student is required to take at least eight psychology courses, including the introductory psychology sequence, intermediate specialty courses, and at least one laboratory course. The minor program itself is quite flexible, designed for students with a broad range of interests and career goals. Students may choose either to distribute the eight psychology courses over a broad range of areas or to focus on one of the four areas corresponding to the major concentrations: Language and Cognition, Learning and Behavior Modification, Personality and Social, and Sensory and Neuropsychology. Students are assigned faculty advisers in the Department to help them select the minor program that best suits their needs.

Topics in Psychology Series (TIPS)

As well as offering courses designed primarily for psychology majors, the Department also offers a variety of courses without prerequisites that are addressed to specific topics of broad current interest. Examples include Psychological Testing, Marriage and the Family, The Disordered Mind, Body Language, Sexual Behavior, Brain and Mind, Psychology and the Law, Animal Communication, Man in Isolation, Memory and Remembering, The Young Offender, and Behavior Problems and Their Therapies.

Sociology and Anthropology Department

Ronald J. McAllister, Ph.D., *Associate Professor and Chairman*

Professors

Morris Freilich, Ph.D.
Elliott A. Krause, Ph.D.
Frank F. Lee, Ph.D.
Jack Levin, Ph.D.
Morton Rubin, Ph.D.
Earl Rubington, Ph.D.

Associate Professors

Richard Bourne, Ph.D.
M. Patricia Golden, Ph.D.
Wilfred E. Holton, Ph.D.
Debra R. Kaufman, Ph.D.
Lila Leibowitz, Ph.D.
Carol A. Owen, Ph.D.

Assistant Professors

Arnold Arluke, Ph.D.
Winifred Breines, Ph.D.
Paul C. Creelan, Ph.D.
C. Paul Dredge, Ph.D.
Maureen Kelleher, Ph.D.
Alan M. Klein, Ph.D.
Thomas H. Koenig, Ph.D.
Bruce K. MacMurray, Ph.D.
Judith Perrole, Ph.D.
Thomas M. Shapiro, Ph.D.
Carmen J. Sirianni, Ph.D.

Professional Preparation

Aims The disciplines of sociology and anthropology apply a critical perspective to the study of social arrangements in which human beings live and die; how societies function and change; and how individuals, groups, and institutions interact in order to better understand those societies, to evaluate how social policy affects daily life, and to study alternative social arrangements.

Description of Major A major in this Department offers background preparation for a wide spectrum of careers in public or private service and research, as well as specific preprofessional training.

Students may concentrate in sociology or anthropology or both. Students who wish to study both must design their own programs, with the help of an adviser. Those enrolled in premedical, prelegal, paramedical, or a variety of other preprofessional programs should find that sociology and anthropology courses can offer a useful background.

A View of the Major Majors may follow either a four-year full-time program or a five-year cooperative course of study. Cooperative work assignments vary from placement in mental hospitals and social agencies to placement in university, government, and other research and policy-making settings. Transfer between the five-year co-op program and the four-year full-time program is possible, and registration in either is not an irreversible decision.

The Department offers both a Bachelor of Arts and a Bachelor of Science degree. The requirements for each degree, both in sociology and in anthropology, are outlined below. A student with specific goals may, of course, take more departmental electives than are required. B.A. students may wish to look at the concentration requirements for B.S. students and consult their advisers for assistance in planning programs with specialized goals.

The Department offers a B.S. with concentrations in anthropology or sociology. Students selecting this option must fulfill all the major requirements set by the Department for the B.A. degree and must take a coherent program involving additional course work as outlined below. Specializations are interdisciplinary and involve more intensive study within a concentration.

A Minor in Sociology In addition to the major program, the Department also offers students majoring in other disciplines the opportunity to take a minor in Sociology. The minor program consists of the following:

- A. 21.100 Introduction to Sociology
- B. Two courses from among
 - 21.240 Research Methods I
 - 21.241 Research Methods II
 - 21.280 Classical Social Thought
 - 21.281 Current Social Thought
- C. Any three-course specialization in sociology arranged between the student and the adviser.

A Minor in Anthropology In addition to its major program, the Department also offers students majoring in other disciplines the opportunity to take a minor in Anthropology.

The minor program consists of the following:

- A. 20.100 Introduction to Social Anthropology
- B. 20.130 Language and Culture
 - 20.135 Individual and Culture
 - 20.160 Sex, Sex Roles, and Family
- C. Any two-course specialization in Anthropology arranged between the student and adviser.

For other minors see Special Programs, page 87.

Anthropology

B.A. students in Anthropology must take at least forty-eight quarter hours in departmental courses, including forty in anthropology and eight in sociology. The exact distribution can be arranged. Minimum requirements are as follows:

- A. Preparatory—Introduction to Anthropology and Introduction to Sociology. (Prospective majors with equivalent background may be exempted. Students should consult a departmental adviser.)
- B. Core Requirements—at least three of the following, as available: Language and Culture; Individual and Culture; Human Origins; Anthropology of Religion; Sex, Sex Roles, and Family; and Peasant Society and Culture.
- C. Electives—Students must take at least six additional electives in anthropology and at least one additional elective in sociology. Qualified students are encouraged to take relevant graduate courses with the consent of the instructor. Majors should freely consult their advisers since courses elsewhere in the University may round out a special interest or focus.
- D. Nondepartmental Requirements—Six courses from the following social sciences: African-American studies, economics, history, political science, and psychology.

B.S. students in Anthropology take the same basic core of courses and, in addition, an individually designed specialization in an area of interest consisting of at least five courses. Students *must* confer with an adviser who will help develop such a program, place it on record, and supervise it. Interdepartmental and interdisciplinary specializations can

be arranged in such areas as linguistics, Native American studies, biological anthropology, psychological anthropology, or area studies focusing on Latin America, Africa, Asia, or the Middle East.

Sociology

B.A. students in Sociology must take at least fifty-two quarter hours in departmental courses, including forty-four in sociology and eight in anthropology, and must meet the following minimum requirements:

- A. Preparatory—Introduction to Anthropology and Introduction to Sociology. (Prospective majors with equivalent background may be exempted. Students should check with the Department.)
- B. Core Requirements—Statistical Analysis; Research Methods I; Research Methods II; Classical Social Thought; Current Social Thought; Class, Power, and Social Change.
- C. Electives—The following are minimum requirements: two intermediate courses (at 100 level); two advanced courses (at 200 level); and one intermediate or advanced anthropology course. With the adviser's consent, qualified students are encouraged to take certain graduate and directed-study courses and/or the Senior Majors Seminar.
- D. Nondepartmental Requirements—Six courses from the following social sciences: African-American studies, economics, history, political science, and psychology.

B.S. students in sociology take the same basic core of courses and, in addition, an individually designed specialization in an area of interest consisting of at least six courses, some from within and some from offerings outside the Department. Students *must* confer with an adviser who will help develop such a program, place it on record, and supervise it. It is possible to arrange specializations focusing on social welfare, health services, political studies, urban studies, education and society, ethnic studies, and organizational studies. There are, of course, many other areas of specialization and possible combinations of courses. The following offer a few examples (courses in the Department of Sociology/Anthropology are indicated by an asterisk):

Social Welfare

- *Sociology of Poverty
- *Social Policy and Social Intervention
- *Sociology of Human Service Organization
- Private and Public Assistance
- The Welfare System in America
- Income Inequalities and Discrimination
- Politics of Poverty

Health Services

- *Medical Sociology
- *Death and Dying
- *Health Care as a Social Issue
- *Culture and Mental Illness
- Aging and Society
- Sociology of Mental Health
- Medicine, Religion, and the Healer's Art
- Medical Economics
- Community Medicine and
- Health-Care Delivery
- Human Services Administration

Urban Studies (Contact the College of Arts and Sciences for information on the Urban Studies interdisciplinary minor.)

- *Cities and Society
- *Community Analysis
- *Suburb and Metropolis
- *Seminar in Urban Studies
- Urban Politics
- Urban Economics
- The Economics of Urban Poverty
- American Urban History
- Architecture and the City

Law and Society

- *Crime, Conflict, and Justice
- *Sociological Theories of Crime
- *Social Policy and Social Intervention
- Civil Liberties
- Law and Society
- The Economics of Crime
- The Politics of the Criminal
- Justice System

Occupations and Professions

- *Occupations and Professions
- *Sociology of Work
- *Social Roles in the Business World
- *Medical Sociology
- Labor Market Economics
- History of the Professions

Sex Roles and Family

- *Sex, Sex Roles, and Family
- *Sociology of the Family
- *Kinship and Society
- *Sex-Gender Roles in a Changing Society
- *Violence in Family
- Sex Roles in American Politics
- Women in Modern Europe
- The Black Family

Organizational Studies

- *Sociology of Business and Industry
- *Sociology of Work
- *Administration and Formal Organization
- *Social Policy and Social Intervention
- *Social Roles in the Business World
- *Human Services Organization
- Organization Theory
- People in Organizations

Deviance

- *Social Deviance
- *Drugs and Society
- *Sociology of Alcoholism
- *Juvenile Delinquency

- *Sociological Theories of Crime
- The Disordered Mind
- Abnormal Psychology I, II
- The Female Offender

Social Psychology (Contact the College of Arts and Sciences for information on the Social Psychology interdisciplinary minor.)

- *Social Psychology (Sociology,
Psychology Departments)
- *Anthropology of Aggression
- *Group Behavior I, II
- *Seminar Soc. Psych.
Personality
- Psychology Lab. Soc. Psych.
- Psychology Lab. Personality

Popular Culture and Mass Communication

- *Mass Communication and Public Opinion
- *Collective Behavior
- *Leisure, Sport, and Society
- *The Sociology of Everyday Life
- History of Media in America
- The Automobile in America
- Survey of African-American Music
- Popular Culture

**Departmental Course*

These are samples of approaches to particular areas; there are many other possible combinations of courses as well as many other areas of specialization.

Speech Communication Department

Carl W. Eastman, M.A., *Associate Professor and Chairman*

Associate Professor

Michael L. Woodnick, M.S.

Instructor

Andrea D. Mitnick, M.A.

Assistant Professors

Joan F. Drexelius, Ph.D.

John T. Marlier, Ph.D.

Alan J. Zaremba, Ph.D.

Professional Preparation

Aims The Department of Speech Communication seeks to help stimulate the personal and professional growth of the student through a study of the principles and methods of communication.

Courses are designed to aid students in understanding the communication process and the roles of communication in society. The Speech Communication program also helps students to increase their self-awareness and heighten personal development by offering theoretical and experiential learning opportunities.

More than twenty-five courses in such areas as persuasion, group discussion and conference techniques, interpersonal communication, mass media, broadcasting, communication theory, and public address are designed to meet the needs of students, whether majoring or minor-ing in Speech Communication or selecting courses for personal development to supplement professional training in other fields.

Description of the Major The objectives of the Speech Communication major are threefold:

- 1) To stimulate the student's personal growth and development in perception and self-expression through the study of historical, contemporary, and artistic aspects of speech and communication, and to provide organized knowledge and critical insight;
- 2) To help to prepare the student for professions that require both a theoretical and a technical knowledge of communication, such as education, the law, government service, public relations, advertising, social service, industrial communication, and the arts;
- 3) To help prepare the student for advanced graduate study in communication and other professional fields.

Overview Students may receive either a B.A. or B.S. degree through concentrations in Mass Communication, Interpersonal and Organizational Communication, Communication Research and Theory, Advocacy, and Public Address. Through selection of the appropriate concentration within the Department and complementary elective courses in other departments, students are afforded considerable flexibility in tailoring their programs to satisfy their personal and professional needs.

To further provide for the unique needs of students with specialized interests or professional goals, the Department offers directed-study and internship programs. Virtually every Speech Communication major completes one or more projects in each of these programs.

In directed study, the student works closely with a chosen faculty adviser while completing a student-selected research or performance project. Generally commensurate with the workload of a one-quarter course,

directed-study projects deal with such areas as surveying and interpreting communicative behavior, studies of the rhetoric of political campaigns, or the effects of the media on society.

The internship program offers students the opportunity for professional development through field experiences designed to complement or implement their classroom training. Distinct from the Co-op Plan, the internship program provides academic credit for unpaid, part-time, on-site activities during the student's academic quarters. Internships, carefully selected by the student and faculty advisers with an understanding based on the student's goals, often result in the student's placement in active roles in commercial broadcasting studios, advertising firms, and governmental agencies.

Description of Minor Students majoring in such fields as Political Science, Business, and Human or Social Services for Education may develop a minor that complements their academic major by selecting appropriate courses with the aid of a Speech Communication faculty adviser.

Basic theoretical competence and personal skills in the areas of intrapersonal, interpersonal, group, organizational, and public communication may be acquired by taking the following four core courses required of all minors: Introduction to Communication Theory, Business and Professional Speaking, Interpersonal Communication I, and Group Discussion.

Individual needs and specific goals may be satisfied by selecting three additional electives with the approval of the Speech Communication faculty. Recommended elective groupings have been developed for students concentrating in Management, Marketing, Elementary or Secondary Education, Human or Social Services, Political Science, Sociology, Psychology, and Journalism.

Special Programs in the College of Arts and Sciences

Independent Major

After their second quarter, students may petition the dean of the College that they meet the requirements for the Bachelor of Arts degree as independent rather than departmental majors. The independent major must center on a discipline or combination of disciplines in the arts and/or sciences.

A faculty member acting as the student's academic adviser initially reviews the program, which must meet all College requirements. The program is then submitted to the appropriate committee for final approval. Requirements and procedures for the major should be discussed in advance with an academic adviser in the dean's office.

Minors

Students with upperclass status are eligible to select a minor from the arts and sciences departments offering minor programs. Upon completion of a department's minor requirements, the minor can be indicated on the transcript. Since not all departments offer minor programs, students interested in beginning a minor program should consult an academic adviser in the dean's office, the department chairperson, or the program director.

Currently, minors are offered in the following areas:

African-American Studies
 Anthropology
 Art
 Biology
 Chemistry
 Computer Science
 Drama (with options in Performance, Technical Theatre Design, Drama Literature and Criticism)
 Economics
 English (with options in Writing, American Literature, British Literature, Literary Analysis, English and Linguistics)
 Geology
 History
 Linguistics
 Marine Studies
 Modern Language (with options in French, Spanish, German, Russian, Italian)
 Media Studies (interdisciplinary)
 Music
 Philosophy
 Physics
 Political Science
 Psychology (with options in General Language and Cognition, Learning and Behavior Modification, Personality and Social, Sensory and Neuropsychology)
 Sociology (with options in General Sociology, Social Psychology)
 Speech Communication
 Urban Studies
 Women's Studies (interdisciplinary)

Specialization in Personality and Social Psychology

The Departments of Psychology and Sociology/Anthropology have combined their resources to offer students a new interdisciplinary specialization that can be pursued for a degree in either of these academic departments.

The specialization in Personality and Social Psychology offers students the opportunity to acquire a systematic understanding of various life processes, such as childrearing, aggression, anxiety, prejudice, attitude formation and change, moral development, and psychopathology. It includes studies of attraction and love, conformity, formation of identity, helping behavior, morality, and other related topics.

Students pursuing an interdisciplinary specialization take courses in both the Psychology and Sociology/Anthropology Departments. However, the student may select the department in which the specialization will be pursued.

In making this selection, the student should consider how each department differs in methods and level of analysis. These differences as well as various course offerings are outlined in a brochure titled *A New Specialization: Personality and Social Psychology*, which can be obtained by writing to the Department of Psychology (234 Nightingale Hall) or the Department of Sociology/Anthropology (500 Holmes Hall). Also, prospective students should discuss their potential department affiliations with Professors Golden or Levin (Sociology/Anthropology) and Professors Harkins or Zamansky (Psychology). (This is an interdisciplinary program that is separate from the socio-psychology specialization outlined on page 84.)

New Minor in Women's Studies

The present student generation is facing a unique challenge in blending home, family, and career roles. Within the context of academic disciplines and to help students meet that challenge, the minor in Women's Studies presents students with opportunities to examine coherently issues surrounding changing gender and sex roles.

Nine courses are required for the minor: Introduction to Women's Studies; Sex, Sex Roles, and Family; five courses selected from the areas of Human Development and Family, Women in History, Women in Literature, and Economic, Political and Social Perspectives on Women; and two research seminars in Women's Studies, which require students to address problems in depth. Working closely with faculty, students will pursue independent research on a topic of their choice and in this way create programs that meet individual personal and professional career needs. Interested students should contact Professor Debra Kaufman in the Department of Sociology and Anthropology, 500 Holmes Hall.

Urban Studies Minor

Most Northeastern students live, work, and play in an urban environment. The Urban Studies Minor seeks to give students the opportunity to gain a broad interdisciplinary perspective on city life, including such topics as the urban economy, social structure, politics, administration, race, geography, history, architecture, and literature.

Completion of the minor requires seven urban-focused courses from the social sciences and humanities. It may include appropriate courses taken as part of the student's major. For further information, please contact the chairperson of the program, Professor Gregory Wassall in the Economics Department.

Marine Studies Minor

In the liberal arts tradition, the College of Arts and Sciences offers a new minor option in Marine Studies. Though not designed as the principal preparation for employment or graduate study in the marine specialties, the program provides students an opportunity for a focus which may enhance the student's academic record for a variety of admission or employment candidacies.

The program is structured to allow a primary, but not an exclusive, emphasis on either the scientific or the social/humanistic study of the oceans. Some physical interaction with the sea is required through demonstrated achievement in a specific marine-related skill, such as scuba diving, sailing, or piloting/navigation. For more information, contact the Sea Quarter Office, 443 Meserve Hall.

Courses in American Sign Language

Students from all majors are welcome to participate in the extensive series of courses on the American Sign Language, the primary language of the American deaf community. Included are courses on beginning and conversational ASL and on Sign Language Interpreting. Students who pursue the sequence of conversational courses not only have the opportunity to learn ASL, but are exposed to linguistic and cultural aspects of the deaf community. The series of interpreting courses offers the student an opportunity to become a Sign Language Interpreter. All courses are taught by experienced instructors, including deaf and hearing teachers, who have native proficiency in ASL and/or background in the linguistics of ASL. (See also Linguistics, page 64.) For more information contact Prof. Cathy Cogen, 276 Holmes Hall.



Boston-Bouvé College of Human Development Professions

Paul M. Lepley, Ed.D., *Dean*

Charles F. Haley, Ed.M., *Associate Dean*

Janice Walker, A.B., *Assistant Dean of the Graduate School*

Jean Czajkowski, *Assistant Dean*



Aims Boston-Bouvé College of Human Development Professions has seven undergraduate departments—Curriculum and Instruction, Foundations of Education, Speech-Language Pathology and Audiology, School and Community Health Education, Physical Education, Physical Therapy, and Recreation and Leisure Studies. The College also has graduate programs in Counselor Education, Curriculum and Instruction, Educational Administration, Foundations of Education, Rehabilitation Administration, Special Education, Speech-Language Pathology and Audiology, Physical Education, Physical Therapy, and Recreation and Leisure Studies, with the Master of Education, Master of Science, CAGS, and Doctor of Education degrees conferred.

The primary goal of the College is to provide the very finest education for every student. To meet demands for fully qualified personnel, the College strives to develop the independent, self-reliant individual.

A View of the Five-Year Program Professional preparation is based in the liberal arts and sciences, with orientation to each profession beginning in the freshman year. There is a concentration on specific competencies spaced throughout the programs and on professional theory and practice in the last two years. In the junior or senior year, all students have the opportunity to synthesize knowledge and skills through supervised experiences in clinical practice, student teaching, field experience, or internships. Each curriculum is enriched by cooperative experiences that, for the most part, are related to a student's area of specialization. At times, these experiences are professionally unrelated, but are always concerned with people, thus providing an opportunity of inestimable value in any career.

Facilities

The facilities of the College are quite diversified. Dockser Hall houses administrative and faculty offices, classrooms, reading rooms, gymnasium, dance studio, physiology of exercise laboratory, locker and shower facilities, as well as a community recreation laboratory, arts and crafts area, seminar rooms, and a motor-learning laboratory. The swimming pool, weight room, handball/racquetball courts, offices, and shower and dressing facilities are located in the Barletta Natatorium complex. The Cabot Building, attached to Barletta, contains one very large gymnasium and another well equipped for gymnastics, as well as wrestling, exercise, and weight training rooms, an indoor track and activity area, offices, and extensive locker room space.

In Room 1, Holmes Hall, the Department of Curriculum and Instruction provides a Reading Clinic, which permits private corrective instruction of fourteen persons, usually area school children, as firsthand experience related to the department's courses in reading instruction. The department also provides an additional resource in the F. Andre Favat Center, in Nightingale Hall, which houses books and other materials representative of school and agency tools of instruction and service. Forsyth Building is

the location for a Speech-Language-Hearing Clinic, where students may observe, through one-way glass or television monitors, the actual delivery of clinical services. This clinic and a Speech Communications Research Laboratory are facilities of the Department of Speech-Language Pathology and Audiology.

The Physical Therapy Department is located in Mary Gass Robinson Hall. On the third and fourth floors are the physical therapy faculty offices, the Lupean Professional Library, classrooms, and three laboratories. The laboratories are designed and equipped specifically for the practice of clinical procedures. The library's reading room supplements the University library, maintaining an up-to-date collection of physical therapy and medical books for use by students and faculty in the program and the College.

The Warren Center serves as a practical laboratory for the College. Its athletic fields and tennis courts, ropes course, natural setting of lake, woods, fields, streams, winterized cottages, and Hayden Lodge provide year-round opportunities for outdoor learning twenty-five miles from the Boston campus. Courses, conferences, seminars, and workshops are conducted at the Center throughout the year and thus serve University and community needs.

Admission

See page 209 for information concerning admission. In the third year, prior to the first supervised clinical education experience, Physical Therapy students must be examined either by physicians in the University Health Services, at a moderate fee, or by a personal physician.

Graduation Requirements

Degrees Students graduating in Elementary and Secondary Education, Human Services, Health Education, Physical Education, and Speech and Hearing earn the degree of Bachelor of Science in Education; those completing the Recreation and Leisure Studies program are awarded the Bachelor of Science in Recreation and Leisure Studies degree; and students graduating in Physical Therapy receive the degree of Bachelor of Science in Physical Therapy. These degrees are awarded to qualified candidates who have completed the prescribed curricula. Student teaching, field experience, or clinical practice is an integral part of the curriculum and is required for graduation.

Qualifications

Quantitative The quarter hours required in each curriculum differ.

	Q.H.
Elementary/Secondary Education	181/177
Health Education	175
Human Services	176
Physical Education/Athletic Training	180/185
Physical Therapy	170
Recreation and Leisure Studies	172
Speech and Hearing	179

Students must satisfy the requirements of the Department of Cooperative Education before they become eligible for their degrees.

Senior-year course work and required experiences must be completed in full-time residence at Northeastern University or in an educational setting approved by the College.

Qualitative The overall cumulative quality-point averages required to enter each class level are explicitly stated in the Student Handbook. Throughout the professional sequence, students must maintain required averages and demonstrate a high level of personal and professional maturity to continue field practice and be approved for graduation. Because of accreditation recommendations and differences in curricula, variations in qualitative requirements may occur.

Transfer students in any curriculum may be accepted into the College at upperclass levels if there are available spaces. Each transcript is individually assessed for qualification, placement, and course design.

Graduation with Honor

Candidates who have attained superior grades in their academic work will be graduated with honors. Upon special vote of the faculty, a number of this group may be graduated with high honors or highest honors. Students must have been in attendance at the University for at least six quarters before they become eligible for honors at graduation.

Program Accreditation

The curriculum in Physical Therapy is accredited by the American Physical Therapy Association. Elementary and Secondary Education, Health Education, Physical Education, and Speech and Hearing are accredited by the National Council for Accreditation of Teacher Education. Programs in Elementary Education, School Health Education, and Physical Education are also state-approved under the Interstate Certification Compact.

Licensure/Registration

All fifty states have laws governing the practice of physical therapy. In order to be eligible for employment to practice physical therapy, graduates must meet the specific legal requirements of the state in which they wish to work. In most states the requirements include graduation from an accredited school of physical therapy and a satisfactory grade on a written examination. Graduates are responsible for finding out what the specific legal requirements are to practice in the state in which they seek employment.

Certification

Upon successful completion of the programs in Elementary and Secondary Education, School Health Education, and Physical Education, students are eligible to apply for certification by the Commonwealth of Massachusetts. Certification is required for public school teaching, but does not guarantee a position. Reciprocal certification is available in many states of the United States. Graduates are responsible for determining the requirements of the states in which they are interested.

Focus on the Student

There is a uniqueness about this College. Perhaps it is the personal touch, a keen interest in every man and woman, expressed in individualized advice and counsel. The College has its own professional clubs and Dance Theatre. Its social clubs and exciting assemblies contrast with study rooms, seminars, and places for research. There is skiing in winter, camping in summer, and year-round sports.

Community service is stressed in every department—service to those with special needs: the physically handicapped, inner-city youth, the aging.

Department of Curriculum and Instruction

Russell J. Call, Ed.D., *Associate Professor and Chairman*

Professors

Melvin E. Howards, Ph.D.
Maurice Kaufman, Ph.D.
Paul H. Tedesco, Ph.D.

Assistant Professors

Thomas H. Clark, M.A.
Carlton B. Lehmkuhl, Ph.D.
John F. Maguire, Ed.M.

Associate Professors

Nicholas J. Buffone, Ph.D.
Leslie A. Burg, Ed.D.
Mary J. Lee, Ed.M.
Harold A. Miner, Ed.D.
Sandra M. Parker, Ed.D.

The Department of Curriculum and Instruction provides teacher preparation programs in a variety of fields and levels. To assist students enrolled in these programs, the Department utilizes three support units: the Reading Clinic, the F. Andre Favat Learning Resources Center, and the Children's Center (a day-care center). The Children's Center provides day care for eligible children whose parents are faculty, staff, and students of Northeastern University. Information on the Center's Susan L. Orchard Memorial Fund may be found on page 248.

The aims of the Department are to make it possible for students to gain certification in a teaching major and/or level and to acquire the competencies necessary for success in teaching.

Teacher Preparation

Early Childhood Education (K–3) Students in the Early Childhood Education program have the opportunity to pursue studies in the College of Arts and Sciences and in other basic colleges of the University, as well as in the Boston-Bouvé College of Human Development Professions. This broad academic background, combined with experiences in the Cooperative Education program, permits the development of a solid professional base. The University's Children's Center, a day-care facility for children ranging in age from two years and nine months to six years, provides experiences in fieldwork for students in the Early Childhood Education emphasis. Pre-student teaching experiences in appropriate field settings are an integral part of a number of required courses.

Elementary (Grades 1–6) Elementary Education majors acquire a broad academic base by enrolling in courses chosen from the various colleges of the University. Acquiring the necessary teaching competencies is the result of not only the course experiences, but the work experiences in the Cooperative Education program and in the pre-student teaching field activities. In addition to those courses required of all Elementary Education majors, students are expected to choose an area of emphasis from one of the following: Humanities, Language-Reading, Science-Mathematics, or Social Science.

Emphases usually consist of 40 quarter hours of courses. Each emphasis has been designed to help focus the student's studies but does not lead to certification in that specific area. It may, however, serve as a catalyst for further study in a graduate program.

Middle School Education (Grades 5–9) Students enrolling in this major are expected to demonstrate competence in all of the academic subjects generally taught in these grades. Additionally, the equivalent of a college minor in one academic subject is required. The details of this major are worked out with an adviser early in the academic career of the student.

Secondary Education (Grades 9–12) Those interested in teaching grades 9 through 12 may major in one of the following teaching areas: Biology, English, General Science, Mathematics, or Social Studies. Programs in Secondary Education provide not only for the acquiring of a major in one of the fields but also for gaining experience through Cooperative Education and through required courses and pre-student teaching field experiences. All of these assist in the student's effort to achieve the needed competencies.

Student Teaching Student teaching is a full-time experience for a complete academic quarter during the senior year. It follows several experiences that are designed to help the student toward a rewarding quarter of student teaching. A University professor and a cooperating classroom teacher have shared responsibility in the supervision of each student teacher.

Teacher Certification

Inasmuch as public education is a state responsibility, each state prescribes the conditions under which persons may be licensed to teach in its public schools. The requirements for obtaining a certificate for teaching, therefore, vary among the different states.

These programs are designed to meet the requirements for certification in the Commonwealth of Massachusetts and in certain other states. Details may be obtained from the Office of the Dean.

Foundations of Education Department

Joseph Meier, Ed.D., *Associate Professor and Chairman*

Professors

E. Vaughn Guloyan, Ed.D.

John D. Herzog, Ph.D.

Mervin D. Lynch, Ph.D.

Associate Professors

Ronald E. Baptiste, Ed.D.

David L. Cox, Ph.D.

Susan E. Ellerin, Ph.D.

Irene A. Nichols, Ed.D.

Barbara A. Schram, Ed.D.

Alvin D. Zalinger, M.A.

The Department of Foundations of Education offers basic and advanced courses in the Humanities and Behavioral Sciences for students in Education, Human Services, and other Human Development Professions. The aims of these courses are to promote understanding of the processes of intentional socialization and deliberate intervention in people's

lives and to familiarize students with the body of knowledge dealing with the principles of human development and well-being.

The courses are open to students across the University provided they can meet the prerequisites listed in the *Basic Day Colleges Course Descriptions and Curriculum Guide*:

- 50.114 Education and Social Science
- 50.121 Human Development and Learning I
- 50.131 Human Development and Learning II
- 50.132 Creative Expression in Children
- 50.133 Educational Applications of Social Psychology
- 50.134 Mental Health in Teaching
- 50.135 Cross-Cultural Studies of Child Rearing and Education
- 50.136 Language and Cognition: Educational Implications
- 50.137 Seminar in Adolescent Psychology
- 50.138 Seminar in Human Learning and Motivation
- 50.139 Seminar in Early Childhood Development
- 50.141 Measurement and Evaluation
- 50.142 Introduction to Educational Statistics
- 50.152 Comparative Education
- 50.153 Philosophy of Education
- 50.154 Current Issues in American Education
- 50.161 Seminar in Group Process
- 50.162 Day-Care and Nursery Schools: Social and Cultural Origins
- 50.163 Schools as Social Systems
- 50.164 Class and Ethnic Relations in Education
- 50.165 Organization and Politics of School Systems
- 50.166 The Human Services Professions
- 50.167 Educational and Psychosocial Development
- 50.168 Education and Social Change
- 50.190 Directed Study

Physical Education Department

Carl S. Christensen, Ph.D., *Professor and Chairman*

Professors

John W. Fox, Ed.D.
Richard C. Zobel, Ed.D.

Associate Professors

Robert S. Curtin, Ed.D.
William J. Gillespie, Ed.D.
Dorett M. Hope, Ed.D.
Kerkor Kassabian, Ed.M.
Mary P. Nicholson, M.S.
Judith A. Noblitt, M.Ed.
Harold A. Walker, A.B.

Assistant Professors

Glenn A. Boden, M.Ed.
Marilyn A. Cairns, M.S.
John A. Clayton, Ph.D.
Evelyn B. Howard, M.S.
Hugh D. McCracken, Ph.D.
Sara A. Umberger, M.A.
Linda B. Zaichowsky, Ph.D.

Instructor

Michael Gaudiano, M.S.

Professional Preparation with Teacher Certification

The Department of Physical Education conducts an undergraduate professional program for teacher certification in Physical Education, physical education electives for all University students, and the intramural/club program for men and women.

Aims The teacher certification program in Physical Education is designed to offer students the opportunity to prepare themselves as specialists capable of developing the materials and methods appropriate to teaching physical education in public and private schools at all levels — elementary, secondary, and college. Its graduates are qualified as athletic coaches and/or trainers, physical education teachers, directors of athletics, supervisors of physical education, and leaders in YMCAs, YWCAs, health clubs, and other youth organizations.

Description of Major Students majoring in this program are offered a strong background in general education. Elective hours are required in the areas of science, social science, and humanities. Courses in physical education include history, philosophy, principles, curriculum development and class procedures, measurement and evaluation, kinesiology, exercise physiology, and motor development and learning. Students receive instruction in the techniques of coaching the various individual, dual, and team sports, and in adapting these activities to the needs of the handicapped. Because physical education overlaps the fields of health and recreation, Physical Education majors may take courses in these areas.

Areas of emphasis in Physical Education include Athletic Training, Dance, Adapted Physical Education, Sports Communication, Coaching, Gerontology, Cardiovascular Health and Exercise, Elementary School, and Secondary School. Class advisers are available to assist students as selections are made.

A View of the Five-Year Major The development and demonstration of personal skill in performance and teaching are an integral part of the professional program. Each student is expected to demonstrate a competent level of knowledge and skill proficiency in swimming, gymnastics, track, badminton, tennis, rhythmic, volleyball, basketball, conditioning, dance, two team sports, and one individual sport. Skill may be demonstrated through competency testing or by taking the appropriate courses. Major students are assigned supervised student-teaching or field experiences in schools or agencies throughout the Greater Boston area. In addition, students have the opportunity to increase their experience with children or adults through cooperative work assignments and in pre-practicum courses.

Clothing appropriate for physical activity classes is required. Fees may be assessed in courses requiring highly specialized equipment, supplies, or off-campus facilities. A one-week resident program at the Warren Center is required during the spring quarter of the freshman year, for which an additional room and board fee is charged.

Physical Education Nonteaching Options

With judicious use of general studies electives and some adjustment in the basic Physical Education curriculum, students may enroll in one of two nonteaching options in physical education—Cardiovascular Health and Exercise or Sports Communication. Preparation in the former is appropriate for those interested in working in health clubs or spas; stress-testing units; and adult fitness programs in YMCAs, YWCAs, or other private agencies; or as exercise specialists in corporate fitness training programs. The Sports Communication curriculum is appropriate for those interested in pursuing careers involving sports writing for magazines or newspapers or sports reporting via radio and television.

Program Accreditation

The professional program in Physical Education is accredited by the National Council for Accreditation for Teacher Education, the Interstate Certification Compact/National Association of State Directors of Teacher Education and Certification, and the National Athletic Trainers Association.

Certification

Upon successful completion of the Physical Education requirements for graduation, students are eligible to apply for Massachusetts Certification and to teach in Massachusetts public schools. Those who have completed the Athletic Training area of emphasis within the Physical Education curriculum are eligible to apply to the National Athletic Trainers Association to take the certification examination. Certification in Physical Education and/or Athletic Training does not guarantee a position.

**All-University Electives in
Physical Education**

A broad selection of electives in dance, sports, games, aquatics, and gymnastics is offered for all University students. All classes are open to men or to women with instructional modifications where appropriate.

The elective program places focus on the lifetime use of sports, dance, and aquatics for recreational satisfaction and participation. Classes are subject to cancellation if enrollments are too low.

Dance Theatre

The Northeastern University Dance Theatre offers students interested in jazz or modern dance as a performing art the opportunity to choreograph and/or perform in concert. In addition to an annual University concert production, this group presents several lecture-demonstrations and/or community concerts each year. Admission is by audition.

**Intramural and
Extramural Sports**

Students are provided a comprehensive program of intramural and extramural sports through clubs, leagues, and individual participation. Separate leagues are organized for commuting, dormitory and fraternity students. Intramural sports are organized separately for men and women and, for certain activities, on a coeducational basis. Throughout the year, intramural and club participation may be possible in badminton, basketball, fencing, football, golf, gymnastics, modern and jazz dance, swimming, volleyball, water polo, and other sports. A "drop-in" program for individual leisure physical activity is also provided.

Basic Course Requirements

I. General Requirements for All Physical Education Freshmen (Year One)			
Course	Q.H.	Course	Q.H.
English I & II	8	Current Issues in Health	4
Biology I	4	Human Movement	3
Biology II, Chemistry, or Physics	4	Life/Career Planning	3
Social Science I	4	Mathematics	4
History/Philosophy PE	3	General Electives	20
Track & Field	1	First Aid	2
Swimming	1	Group Dynamics	3
Gymnastics I	1	Basketball	1
Volleyball	1	Gymnastics II	1

II. Upperclass Requirements for Teacher Certification Students (Years Two-Five)

Course	Q.H.	Course	Q.H.
Human Development I & II	8	Kinesiology I and II	8
Educational Statistics	4	Measurement and Evaluation	4
Psych. Elective (specified choices)	4	Exercise Physiology I	4
Anatomy and Physiology I & II	8	Theory of Coaching/Play Elementary School	2
Adapted PE I	4	Activities or Secondary School	3
Motor Development	4	Activities	3
Motor Learning	4	Athletic Training	3
Critical Teaching Skills	4	Administration of PE	4
8 Prof. Skill Electives	8	Curricula Development	3
Boston-Bouvé Electives	10	Student Teaching	12
		4 Teaching, Analysis/Coaching Courses	8
		General Studies Electives	20

Graduation Requirement 180 Q.H.; 185 Q.H. for Athletic Training option

Curriculum may be altered because of changes in state certification regulations.

NOTE: Teaching options in Athletic Training, Adapted Physical Education, Sports Communications, Gerontology, Coaching, and Elementary or Secondary School are available with only minor adjustments to the above-listed curriculum.

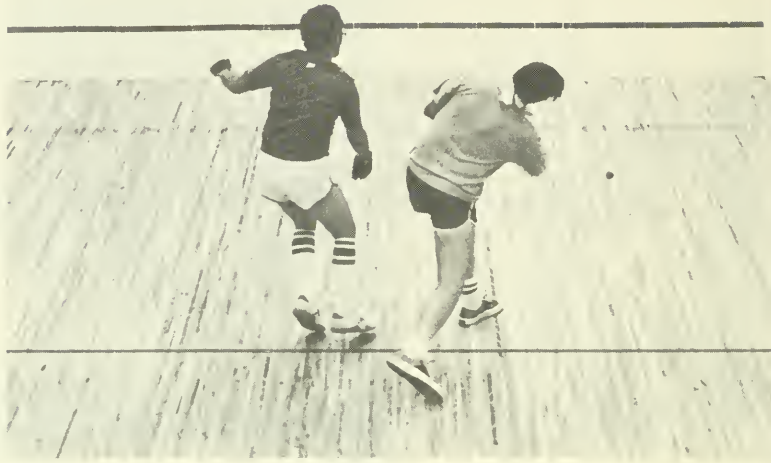




III. Professional Requirements for Nonteaching Option in Sports Communication (Years Two–Five)

Course	Q.H.	Course	Q.H.
Fundamentals of News-writing I & II	8	Human Development I & II	8
Techniques of Journalism I & II	8	Kinesiology I & II	8
Theories of Persuasion	4	Motor Development	4
Grammar for Journalism (required only for those receiving below B in English II)		Motor Learning	4
Take as an elective		Psychology Elective (specified choices)	4
Elect at least one of the following:	4	Theory of Play	2
TV Newswriting		Theory of Coaching	2
Advanced Reporting		Athletic Training	3
TV News Production		Educational Statistics	4
Magazine Writing		Exercise Physiology	4
Basic Photojournalism		Adapted Physical Education	4
Layout and Make-up		Psychology of Coaching & Sport	2
Introduction to Communication Skills		Administration of PE	4
Business & Professional Speaking		Sociology of Sport	2
Interpersonal Communication I		Physical Education Activity Skills	2
Interpersonal Communication II		Coaching/Officiating	2
Anatomy-Physiology I & II	8	Field Experience	12
BBC Electives	9	General Studies Electives	16
		Graduation Requirement	180

NOTE: 10 Q.H. of BBC electives are required.



IV. Professional Requirements for Nonteaching Option:
Cardiovascular Health and Exercise Specialist (Years Two–Five)

Course	Q.H.	Course	Q.H.
Anatomy-Physiology I & II	8	Exercise Physiology	4
Kinesiology I & II	8	Cardiopulmonary Disease	4
Human Development I & II	8	Health Counseling	4
Chemistry I & II	8	Advanced Athletic Training	4
Basic Athletic Training	3	Exercise Testing and Prescription	3
Motor Learning	4	Electrocardiography	2
Motor Development	4	Nutrition	4
Statistics	4	General Electives	8
Psychology Elective (specified choices)	4	Administration of Recreation	4
Public Health	4	Budgeting Systems	4
Clinical Athletic Training	2	Special Problems	4
Measurement & Evaluation	4	Field Experience	12
Counseling Theory and Practice	4	Physical Education Activity Skills: Swimming, Tennis, Conditioning, Badminton, and 7 Electives (these are in addition to the 6 first-year skills)	<u>11</u>
		Graduation Requirement	185

All program options in Physical Education, teaching or nonteaching, must be declared by the end of the sophomore year. Subsequent changes may result in an extended graduation date.

Physical Therapy Department

Christopher E. Bork, Ph.D., *Associate Professor and Chairman*

Professors

Elizabeth J. Fellows, M.A.
Whitney R. Powers, Ph.D.

Associate Professor

Ruth P. Hall, B.S.

Assistant Professors

Catherine M. E. Certo, M.S.
Janet L. Costa, M.S.
Joan S. Lydic, M.S.
Paul F. Mettler, M.S.
Ruth Rose-Jacobs, M.S.
Pamela A. Stanton, M.S.

Instructors

George B. Coggeshall, M.S.
Nancy C. Gilberti, M.S.
Dolores A. Price, B.S.
Edward M. Quinn, M.S.

Clinical Supervisor/

Clinical Assistant Professor

Meredith E. Drench, M.Ed.

Professional Preparation

Aims The Department of Physical Therapy is dedicated to the preparation of therapists who can provide services of the highest quality in a time of changing concepts, new trends, and new challenges. Students will have the opportunities to acquire the skill to help patients gain functional independence and to learn to recognize and assist with emotional and socioeconomic problems that affect recovery.

Description of Major Physical Therapy is one of the health professions contributing to the delivery of comprehensive health care. The physical therapist is highly skilled in evaluation procedures and in the planning and execution of treatment programs appropriate to a patient's condition or disabilities. Additional responsibilities may include health-care planning and community service.

Physical therapists are employed in institutions such as general hospitals, children's hospitals, university hospitals, rehabilitation centers, schools or centers for crippled children, nursing homes, extended-care facilities, and community, state, and federal agencies. Private practice is another option chosen by physical therapists. In addition, there are increasing opportunities in teaching and research in physical therapy.

A View of the Five-Year Major The five-year program in Physical Therapy, based on the cooperative plan, is unique in physical therapy education.

The program of study integrates liberal arts and sciences and professional courses, with major emphasis on liberal arts in the first two years of the program and on professional preparation in the last three years. The professional courses include such subjects as anatomy, kinesiology, pathology, clinical medicine, neurology, orthopedics, physiology, physical therapy procedures, and administration, as well as clinical experience in various hospitals and clinics.

Lecturers from Tufts University School of Medicine and the New England Medical Center Hospitals, as well as from medical and social agencies in the Boston area, augment the professional staff in the Physical Therapy program.

Supervised clinical education is a strong component of the curriculum and a requirement for graduation. Clinical experience provides the student with opportunities to practice various phases of physical therapy under supervision in preparation for qualifying as a physical therapist. Assignments in clinical education are not confined to the Boston area. They may include physical therapy departments throughout the country, particularly in many states along the eastern seaboard.

Students admitted to the Department of Physical Therapy must maintain acceptable standards of scholarship and performance in the prescribed program. They must also demonstrate good health, verbal fluency, essential motor skills, and emotional maturity; they must complete all required courses and have favorable evaluations from clinical education and co-op experience. To continue in the program, students are required to maintain a grade of C or better in all professional courses.

Clinical Education Students on clinical education assignments should plan on additional expenses, including travel.

Accreditation

The program is accredited by the American Physical Therapy Association. Graduates are eligible to apply for state licensure or registration and for membership in the American Physical Therapy Association.

Licensure/Registration

All fifty states have laws governing the practice of physical therapy. To be eligible for employment to practice physical therapy, graduates must meet the legal requirements of the state in which they wish to work. In most states, the requirements include graduation from an accredited school of physical therapy and a satisfactory grade on a written examination. Graduates are responsible for finding out what the specific legal requirements are to practice in the state in which they seek employment.

Sample Freshman-Year Program of Studies in Physical Therapy

First Quarter

Foundations of Psychology I
Fundamentals of Mathematics
Basic Animal Biology
Health Education
First Aid

Third Quarter

General Chemistry
Basic Animal Biology
English

Second Quarter

Fundamentals of Mathematics
General Chemistry
English
Introduction to Physical Therapy

In addition to the above courses, students may elect to take Basic ROTC.

Basic Course Requirements**I. General Requirements**

Course	Q.H.	Course	Q.H.
Fundamentals of Mathematics*	8	Basic Physics†	9
Basic Animal Biology*	8	Human Physiology†	8
English*	8	Human Anatomy†	4
General Chemistry*	10	Foundations of Psychology I*	4
Current Issues in Health*	4	4 General Electives	16
First Aid	2	Foundations of Psychology II†	4

II. Professional Requirements

Course	Q.H.	Course	Q.H.
Introduction to Physical Therapy*	2	Advanced Therapeutic Exercise	5
Introduction to Physical Therapy†	2	Neuroanatomy	4
Perceptual and Motor Learning†	3	Integration of Therapeutic Exercise	2
Clinical Gross Anatomy	6	Electrical Testing and Treatment Procedures	2
Physiology for Physical Therapists	3	Research Design	4
Massage	2	Psychosocial Aspects of Illness	3
Clinical Medicine I, II, III	10	Physical Therapy in the Health Care System	3
Clinical Psychiatry	2	Supervised Clinical Education	5
Clinical Kinesiology	4	Clinical Seminar	2
Basic Therapeutic Exercise	4	Administration	3
Evaluation Procedures	3	Investigative Studies	6
Prosthetics/Orthotics and Functional Activities	3	Graduation Requirement	170
Management of Medical/Surgical Respiratory Disorders	2		

*These courses are usually taken in the freshman year.

†These courses are usually taken in the sophomore year.

Department of Recreation and Leisure Studies

George R. Atkinson, Ed.D., *Assistant Professor and Acting Chairman*

Professor

Peter J. Graham, Ed.D.

Assistant Professors

John W. Shank, M.S.

Associate Professors

Elaine G. Eliopoulos, Ed.D.

Richard B. Morrison, Ed.D.

Frank M. Robinson, M.S.

Instructor

Patricia A. Shank, M.S.

Professional Preparation

Aims Recreation is a vital profession in this rapidly changing world. A major in Recreation and Leisure Studies offers diversified curricular opportunities and multiple career options for graduates. As societal changes reflect a balance of work, education, and leisure, the Recreation and Leisure Studies program prepares students to guide others in the integration, planning, and sorting out of changes throughout their life span and to manage recreation agencies in a variety of leisure service settings.

Description of Major The curriculum provides an opportunity for students to select from one of three flexible professional career areas of concentration: Recreation Management, Therapeutic Recreation, and Outdoor Recreation/Environmental Education. The Recreation Management concentration is designed to provide students with the knowledge and skills that will enable them to pursue positions in commercial recreation and tourism; planning firms, management organizations; federal, state, and local public agencies; consulting firms; health and fitness centers; and private agencies. The Therapeutic Recreation concentration is designed to equip students with the professional job skills that are essential to work with disabled people in institutions and community-based settings, including hospitals, rehabilitation facilities, nursing homes, schools, and residential centers as well as day-care vocational/avocational centers and in therapy collaboratives. Students with an emphasis in Outdoor Recreation/Environmental Education have an opportunity to pursue positions as interpreters, park rangers, resource recreation managers and planners, conservationists, and environmental impact specialists.

A View of the Five-Year Major The cooperative program of study is based in the liberal arts and sciences, with courses in professional education beginning in the freshman year. All students take a common department core of courses and professional skills that complement one of three areas of concentration.

An internship in a selected recreation and leisure service setting provides both an exciting and practical opportunity for students to gain professional, career-level work experience. In addition, the cooperative plan offers an opportunity for practical, on-the-job experience in youth agencies, municipal recreation departments, private recreation agencies, hospitals and institutions, nursing homes, commercial recreation and tourism organizations, and many more selected settings.

A variety of experiential education opportunities supplementing regular course offerings is available at the Warren Center of Northeastern University, a unique teaching-learning laboratory within easy commuting distance of Boston, and through the Swiss Studies overseas summer program centered in Leysin, Switzerland.

Special Requirements

Students are scheduled for their one-week resident camp experience at the beginning of the freshman year at the Warren Center in Ashland, approximately 25 miles west of the Boston Campus. The cost of this experience is approximately \$100 per student.

One week of instruction in skiing and winter sports is scheduled as an elective during the winter quarter of the junior or senior year. The cost is approximately \$160–\$170 per student.

Sample Freshman-Year Program of Studies in Recreation and Leisure Studies

One-Week Camp Experience Prior to Opening of Academic Year

First Quarter

English
Speech Fundamentals
Social Science
Life Career Planning

Second Quarter

Basic Biology
English
Social Science
Foundation of Leadership in
Leisure Services

Third Quarter

Basic Biology
Current Issues in Health
Social Science
Recreation Skills

Basic Course Requirements (172 QH are required for graduation)

I. General Requirements (85 QH)

Course	Q.H.	Course	Q.H.
Biology	8	Earth Science electives	8
English	8	Anatomy and Physiology	8
Social Science	12	Free Electives	26
Speech Fundamentals	3		
Current Issues in Health	4		
Human Development	8		

II. Professional Core Requirements for All Students (55 QH)

Course	Q.H.	Course	Q.H.
Life/Career Planning	4	Foundations of Leadership in Leisure Services	4
Intro to Recreation and Leisure	3	Dept./Univ. Skill electives	8
Research	8	Intern. Seminar	1
Program Planning	4	Internship in Recreation	16
Group Dynamics	3	Senior Seminar	4

 III. Professional Requirements for Recreation Management Concentration (32 QH)

Course	Q.H.
Budget Analysis	4
Elements of Outdoor Recreation Planning	4
Administration of Recreation and Parks	4
Program Evaluation	4
Professional Electives	16



 IV. Professional Requirements for Therapeutic Recreation Concentration (32 QH)

Course	Q.H.	Course	Q.H.
Social and Psychological Impacts of Disabilities	4	Overview of Physical Disabilities	4
Foundations of Psychiatric Service in Therapeutic Recreation	4	Program Planning in Therapeutic Recreation	4
		Process of Aging	3
		Professional Electives	13

 V. Professional Requirements for Outdoor Recreation/Environmental Education Concentration (32 QH)

Course	Q.H.	Course	Q.H.
Environmental Education	4	Elements of Outdoor Recreation Planning	4
Seminar on Environmental Issues and Legislation	4	Survey of Recreation Facilities	3
Interpretation of Ecological and Social History	4	Professional Electives	13

 VI. Professional Electives

Course	Q.H.	Course	Q.H.
Sports Leadership	2	Social Dance Leadership	2
Survey of Aquatics	2	Leisure and the Community	
Introduction to Winter		School	4
Skills	1	Leisure Counseling	4
Camp Leadership	2	Workshop Design	3
Survey of Recreation		Urban Recreation	4
Facilities	3	Therapeutic Recreation with	
Basic Sailing	2	Developmentally Disabled	
Tripping and Orienteering	2	Persons	4
Winter Sports	2		
Camp Administration	3		
Outdoor Education for the			
Handicapped	3		
Basic Rockclimbing and			
Rappelling	2		
Leisure and Lifestyles	4		
Concepts of Leisure:			
Sociopsychological			
Perspectives	4		
Leadership and Organization			
of Wilderness Recreation	4		
Arts and Crafts for Leisure	4		

School and Community Health Education Department

George R. Atkinson, Ed.D., *Assistant Professor and Acting Chairman*

Professor

H. Marie Garrity, Ed.D.

Adjunct Professor

Elizabeth A. Neilson, Ed.D.

Assistant Professors

Ann M. Downey, Ph.D.

Dale A. Rublee, Ph.D.

Professional Preparation

Aims Health Education is a relatively new profession concerned with the improvement of individual and community health status through educational activities. While working in a variety of settings such as volunteer health agencies, public health clinics, elementary and secondary schools, or health planning organizations, the health educator facilitates health-promoting behavior changes as a means to enriching the quality of life. The health educator uses techniques and information from both medical and educational fields in order to assist individuals and communities dealing with emotional, physical, or social aspects of health.

Description of Major Since health has psychological, physical, and social components, the program of study is organized to help students develop an understanding of each of these, as well as their interaction. Course study during the first part of the program emphasizes the foundations of health education in the social and life sciences. Practical experience in health education is included throughout the program to provide the student an opportunity to apply theory and techniques with Boston-area groups. Major courses on contemporary health issues help prepare the student to understand details and complexities of several important health topics. Educational issues and approaches are included in courses to help students understand the role of education in improving health.

Overall, the program of study is intended to produce graduates with the competence to diagnose the health education needs of groups and to develop, organize, and evaluate effective educational activities.

The undergraduate program in Health Education offers students, through the Cooperative Plan of Education, the opportunity to graduate with more than a year's work experience in the field. Through placements with health or educational organizations in the Boston area, students can also finance part of their education while gaining on-the-job work experience.

Although individual health status is determined by genetics, environment, diet, and behavior, current research indicates that behavior is the determinant most likely to influence further improvements in the health of individuals. Health education is directed primarily at health behaviors in order to prevent health problems and to promote health. Throughout the program of study, the concepts of prevention, health promotion, wellness, and holistic health serve as common threads in professional preparation. The development of specific competencies for health education roles is an objective in each of the Department program requirements.

College and University Services

The Department of School and Community Health Education is interested in the health status of the University community. In an attempt to meet the health needs of students, several elective courses are offered regularly on selected health issues of potential personal and professional interest to any University student. Courses on topics such as stress and health, nutrition, sexuality, mental health, consumer health, drug use/abuse, and aging are designed to provide current information and concepts related to wellness and health promotion. Instruction is organized into lectures, discussion groups, and demonstrations to provide students the opportunity to understand the significance and application of recent health-related research findings in their own lives.

Program Accreditation

The professional program in School Health Education is accredited by the National Council for Accreditation of Teacher Education and is approved under the Interstate Certification Compact. Although there are no official accreditation standards for Community Health Education programs in the United States, the Northeastern program is based upon professional preparation guidelines widely accepted in the field of health education.

Certification

Upon successful completion of the requirements for graduation in Health Education, students in School Health Education are eligible to apply for Massachusetts Certification and to teach in the public schools of Massachusetts. Certification is also readily obtained in other states having certification reciprocity agreements with the Massachusetts Department of Education. There are no certification criteria for students in Community Health Education. However, all students must satisfy departmental requirements before being approved for graduation in School and/or Community Health Education.

Sample Freshman-Year Program of Studies in School and Community Health Education

First Quarter

General Chemistry
English
Education and Social Science
Current Issues in Health
First Aid
Physical Education

Third Quarter

Health Concerns of Youth
Biology
English
Mathematics or General
Studies Elective
Physical Education

Second Quarter

General Chemistry
Biology
Education and Social Science
Elective
Instructional Resources
Introduction to Safety
Foundations of Health Education



Basic Course Requirements**I. General and Professionally Related Requirements**

Course	Q.H.	Course	Q.H.
General Chemistry*	8	Social Science*	8
English*	8	Human Development†	8
Biology*	8	Measurement and Evaluation	4
Microbiology	4	Introduction to Special Education	4
Mathematics*	4	Humanistic Foundations	4
Psychology	8	Physical Education	2
Anthropology	4	General Studies Electives	20
Anatomy and Physiology	12		

*Courses are usually taken in the freshman year.

†Courses are usually taken in the sophomore year.

II. Professional Requirements

Course	Q.H.	Course	Q.H.
Foundations of Health Education*	2	Community Health Organization and Administration of School and Community Health Education	4
Human Sexuality/Family Drug Use and Abuse	4	First Aid*	2
Mental Health	4	Instructional Resources*	2
Nutrition	4	Health Concerns of Youth*	4
Seminar in Health Education	4	Concepts in Health, Aging and Longevity	4
Health Counseling	4	Practicum in School Health or Practicum in Community Health	12
Teaching Procedures/ Curriculum			
Health Education for School and Community	4		
Communicable/ Degenerative Diseases	4		
Introduction to Safety	2		
Current Issues in Health	4		

*Courses are usually taken in the freshman year.

Speech-Language Pathology and Audiology Department

Robert B. Redden, Ed.D., *Associate Professor and Acting Chairman*

Professor

Robert J. Ferullo, Ed.D.

Associate Professor

Arlene T. Greenstein, Ph.D.

Assistant Professors

Mary Florentine, Ph.D.

F. Adele Proctor, Sc.D.

Clinical Supervisor/

Clinical Assistant Professor

Helen Anis, M.A.

Clinical Supervisors/

Clinical Instructors

Nilda M. Collazo, M.S.

Judith M. Goldstein, M.A.

Susan Ross-Abrahamson, Ed.D.

Rose Laurie Schloff, M.S.

Victoria M. Silberstein, M.A.

Professional Preparation

Students in the Speech and Hearing major pursue scientific study of the processes of individual human communication. Particular emphasis is placed on speech, language, and hearing.

Aims To achieve a minimal level of clinical competence as a speech-language pathologist or audiologist, students are required to undertake study at the master's degree level. This major seeks to prepare students for professional graduate study and subsequent application for membership in and certification by the American Speech-Language-Hearing Association.

Description of Major Preprofessional preparation involves a specialized academic experience that provides study of the normal communication processes, the development and disorders thereof; evaluation procedures; and clinical techniques. The emphasis of this major is on the normal processes of communication.

A View of the Five-Year Concentration College and general education requirements include elementary courses in psychology, sociology, anatomy, statistics, education, mathematics, and science.

Required studies of the normal communication processes cover the normal development and use of speech-language and hearing with an emphasis on the normal aspects of human communication. Content areas are: 1) anatomic and physiologic bases, such as neurology, anatomy, and physiology of speech, language, and hearing mechanisms; 2) physical bases and processes of the perception and production of speech and hearing, e.g., acoustics (or physics of sound), phonology, physiologic and acoustic phonetics, and perceptual processes; 3) linguistics, sociolinguistics, and psycholinguistics.

Basic Course Requirements

I. General Requirements for All Students

Course	Q.H.	Course	Q.H.
English I & II	8	Personality	8
Human Organism	4	Electives*	44
Education & Social Science	4	Abnormal Psychology	8
Human Development I	4	Electives	28
Intro. to Educational Statistics	4		

**These electives must include: 8 QH in Educational Sociology, 4 QH in Educational Psychology, 16 QH in Liberal Arts Humanities, 4 QH in Liberal Arts Social Science, 4 QH in Education, 8 QH in Liberal Arts Math/Science.*

II. Preprofessional Major Requirements

Course	Q.H.	Course	Q.H.
Intro. to Speech and Hearing	4	Fundamental Reading	4
Basic Manual Communication	4	Professional Development	1
Anatomy & Vocal Mechanism	4	Diagnostic Techniques	4
Intro. to Special Education	4	Orientation to Clinical Practice	4
Developmental Semantics & Syntax	4	Phonemic Disorders	4
Speech Science	4	Developmental Phonology	4
Intro. to Audiology	4	Hearing Science	4
Fluency Disorders	4	Clinical Practice	4

III. Sample Freshman-Year Program of Studies for All Majors in Speech and Hearing

First Quarter

English 1
Education and Social Science
Human Organism
Elective*

Third Quarter

Introduction to Speech & Hearing
Elective*
Elective*
Elective*

Second Quarter

English II
Basic Manual Communication
Elective*
Elective*

**Freshmen are encouraged to consult with their departmental advisers in choosing these electives.*

During the junior and senior years the student pursues beginning courses in: understanding speech-language and hearing disorders; evaluation skills, such as procedures, techniques, and instrumentation used to assess communication disorders; and management procedures, such as principles in therapy.

During the senior year students perform supervised introductory clinical practice in a school setting. The focus is on remediation, not on classroom teaching.

The Speech-Language-Hearing Clinic is an on-campus facility that is utilized for the delivery of clinical services. Students observe via one-way windows and closed-circuit television monitors. The clinic is approved by the Professional Services Board of the American Speech-Language-Hearing Association.

The Speech Communication Research Laboratory is a facility within the Department wherein students obtain laboratory experiences in Audiology and Speech.

NUSSHA (Northeastern University Student Speech and Hearing Association) sponsors professional speakers, films, videotapes, and social activities.

Program Accreditation

The Education and Training Board of the American Speech-Language-Hearing Association accredits graduate programs only. The graduate program at Northeastern is accredited.

The preprofessional program is accredited by the National Council for Accreditation of Teacher Education.

Certification

Following completion of the master's degree, the graduate must pass a national examination in Speech-Language Pathology or Audiology and complete a Clinical Fellowship Year, which is nine months of supervised clinical experience.

Human Services

An interdisciplinary major involving the Boston-Bouvé College of Human Development Professions and the College of Arts and Sciences

Susan E. Massenzio, Ph.D., *Program Director, Rehabilitation and Special Education*

Advisers

John D. Herzog, Ph.D., *Foundations of Education*

Wilfred E. Holton, Ph.D., *Sociology/Anthropology*

Ronald J. McAllister, Ph.D., *Sociology/Anthropology*

Alvin Zalinger, M.A., *Foundations of Education*

Harold S. Zamansky, Ph.D., *Psychology*

Fieldwork Supervisor

Natalie H. Riffin, M.Ed., O.T.R.

Human Services

Aims This major offers students the opportunity to prepare themselves for possible careers in one of the areas broadly defined as "human services." The program is interdisciplinary. The Human Services curriculum allows students to obtain the fundamental attitudes, knowledge, and skills that can lead to a meaningful career in the helping professions as well as to a graduate education in a variety of fields.

Students who major in Human Services prepare themselves to perform a variety of functions in public and private agencies. Through course work, two quarters of fieldwork experience, and possible co-op jobs, students have the opportunity to explore such areas as: casework services in social service and welfare agencies; therapeutic treatment programs in mental health settings; supportive counseling in community health centers; rehabilitation counseling services; sheltered workshops; parole counseling; court liaison in programs for delinquent youth; staff work in half-way houses, penal institutions, and drug treatment centers; supportive counseling for the mentally retarded; community organizing; services for the aging; administration in human services agencies; and social program research and evaluation.

Description of the Major The five basic aspects of this program beyond the college requirements are:

I. Prerequisite Courses—Courses in the areas of sociology, psychology, economics, government, and human services.

II. Core Courses—Courses in the areas of statistics, research methods, personality and abnormal psychology, social structure, group process, human services organizations, and intervention strategies.

III. Specified Electives—Three courses in poverty, minority affairs, and/or special needs.

IV. Specializations—Five courses that focus on a student's area of interest and selected in consultation with an adviser.

V. Supervised Field Experience—During the junior and senior years, students spend 300 hours in a supervised placement in a public or private agency, usually in separate experiences of 150 hours each.

A View of the Five-Year Major The Human Services major offers students the opportunity to obtain useful values and basic knowledge relating to various human services fields. Courses introducing some basic skills can help them to understand and work with a variety of helping services.

Human Services students at Northeastern have been very active in their major and helpful to each other. The Human Services Student Organization combines social and career-related activities, which in the past have included open houses, day-long conferences, and weekend retreats. A quarterly *Human Services Newsletter* is published by students and faculty.

College of Business Administration

David H. Blake, Ph.D., *Dean*

Daniel J. McCarthy, D.B.A., *Associate Dean*

Thomas E. Moore, M.B.A., *Associate Dean*

Barbara W. Reitz, M.B.A., *Assistant Dean*

Christine Chevoor, A.B., *Assistant to the Dean, External Relations*

Maryann G. Billington, M.B.A., *Assistant Dean (Graduate School)*

Dennis Ramsier, M.B.A., *Assistant Dean (Undergraduate Program)*

Ann Kelly Komer, B.A., *Assistant to the Dean*

Peter J. Gargano, B.A., *Administrative Assistant*

Hazel Sypher, *Administrative Assistant*

Accounting Group

Cowan Chair Research

Professor

Ronald M. Copeland, Ph.D.

Professors

Joseph R. Curran, Ph.D.

Joseph M. Golemme, M.A.,

C.P.A., *Director, Graduate*

School of Professional

Accounting (Harold A. Mock

Professor of Accounting)

Russell W. Olive, D.B.A., P.E.

Associate Professors

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Paul A. Janell, Ph.D., C.P.A.

Richard Lindhe, Ph.D.

Daniel C. Scioletti, J.D.

Assistant Professors

Richard L. Keith, M.B.A.

Denis M. Lee, Ph.D.

Lynn Marples, M.B.A.

Sharon M. McKinnon, Ph.D.

John R. Schryver, Ph.D.

Stephen Tomczyk, D.B.A.

Barbara B. Vidulich, D.B.A.

James F. Volkert, Ph.D.

Lecturers

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Peggy L. O'Kelly, M.B.A., C.P.A.

Jonathan Pond, M.B.A., C.P.A.

Alan Tobin, B.S.

Finance and Insurance Group

Professors

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Wesley W. Marple, D.B.A.

Edward R. Willett, Ph.D.

Associate Professors

Lal C. Chugh, Ph.D.

John C. Edmunds, D.B.A.

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Gerald P. Madden, Ph.D.

Joseph W. Meador, Ph.D.

Jonathan B. Welch, Ph.D.

Assistant Professors

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Carolyn V. Kent, Ph.D.

Stephen A. Kursh, A.M.

David Leggett, Ph.D.

Stephen Marder, Ph.D.

Coleen C. Pantalone, Ph.D.

Harlan D. Platt, Ph.D.

General Management Group

Professors

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Associate Professors

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Robert H. Ketchum, Ph.D.

Raymond M. Kinnunen, D.B.A.

James F. Molloy, M.B.A.

Vincent O'Rourke, Jr., Ph.D.

John A. Seeger, D.B.A.

David Silverstein, M.B.A.

Assistant Professors

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Heidi V. Wortzel, Ph.D.

Human Resources Group

Professors

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Associate Professors

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Ralph Katz, Ph.D.
Andre P. Priem, M.A.
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Edward G. Wertheim, Ph.D.

Assistant Professors

Rae Andre, Ph.D.
David B. Balkin, Ph.D.
Thomas M. Begley, Ph.D.
David P. Boyd, Ph.D.
Henry M. Frechette, Ph.D.
Timm L. Kainen, Ph.D.
Mark P. Kriger, M.A., M.S.
Paulette A. McCarty, Ph.D.
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Management Science Group

Associate Professors

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Victor B. Godin, D.B.A.
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Carl W. Nelson, Ph.D.
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Assistant Professors

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Peter J. Billington, M.B.A.
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Sangit Chatterjee, Ph.D.
Nancy Jo Klein Delaney, Ph.D.
William L. Huth, Ph.D.
Paul M. Morris, Ph.D.
Erland V. Sorensen, M.B.A.
Savita Verma, Ph.D. (Visiting)

Marketing Group

Professors

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Associate Professors

Dan T. Dunn, D.B.A.
Edward T. Popper, D.B.A.
Samuel Rabino, Ph.D.
Robert F. Young, D.B.A.

Assistant Professors

Robert M. Schindler, Ph.D.
Maggie J. W. Smith, M.B.A.

Lecturers

Hyman Dushman, M.B.A., C.P.A.
Robert J. Kopp, M.B.A.

Center for Management Development

Richard J. Santos, M.B.,
Associate Dean and Director
John J. Leary, Jr., M.B.A.,
Associate Director
Bric A. Wheeler, B.S., M.B.A.,
Director of the Management Workshop

Professional Preparation

The College of Business Administration offers concentrations in the principal fields of business: Accounting, Entrepreneurship and New Venture Management (Small Business Management), Finance and Insurance, Human Resources Management, International Business, Management, Marketing, and Transportation and Physical Distribution Management. There is also a provision for those students who wish to design their own concentrations.

These programs are designed for men and women seeking to prepare themselves for managerial responsibility in business, government, and other organizations with the goal of developing the ability to recognize and solve problems and to understand the role of the business firm in the community, the nation, and the world.

In developing these skills, the students have the opportunity to gain not only a broad understanding of business and organizational problems through specialized courses, but also firsthand knowledge of effective solutions. Forty to sixty percent of the course work in the College of Business Administration concentrations is centered outside business to ensure a liberal education.

All concentrations are offered only on the five-year Cooperative Plan, providing most students with substantial practical experience, usually in the fields for which they are preparing.

Aims In keeping with the current trends in collegiate education, the College has adopted the following educational aims:

1. To develop attitudes and ideals that are ethically sound and socially desirable;
2. To cultivate an awareness of the social, political, and economic developments to which the business firm must adapt;
3. To develop the habits of accurate thinking that are essential to sound judgment and the habits of accurate expression that are essential to effective communication;
4. To provide an opportunity for students to develop a specialization in business in accordance with their interests and talents.

A View of the Five-Year Program The College of Business Administration offers a Bachelor of Science in Business Administration degree and has concentrations of courses in several areas. The College combines its business curriculum with courses from the sciences, humanities, and social sciences. Students must take courses in these areas to ensure a well-rounded background so valuable in the business world.

All students in the College are required to complete, in addition to their academic courses, the program of cooperative education. This program gives the student the opportunity to challenge and reinforce in the work place the theories and techniques learned in the classroom. In a similar way, the "well, that's the way they do it in my co-op company" attitudes can be and are questioned in the classroom. This double-faceted approach enhances the whole education process and generally produces graduates with a more realistic understanding of the work place. Cooperative work assignments generally are full-time, professional positions with organizations both in the profit and not-for-profit private sector and in government. Work assignments are for six months of each year above the freshman level.

After the foundation-laying and tools-oriented course work (combined with a large number of non-business courses) of the first two years, the final three years emphasize the various functional areas of business and require students to concentrate their studies in specific areas. (Detailed descriptions of these areas follow this section.) In most of these upper-division courses the traditional lecture-and-recitation format is supplemented by problem-solving and case-study methods. Using these, students analyze actual businesses and business problems and present

recommendations for possible solutions. Students are encouraged to develop the ability to think independently, to support ideas with fact and logic, and to analyze and challenge propositions. The added experience of co-op work assignments, when combined with course work, offers each student practical exposure to the responsibilities of various administrative positions as well as help in determining the kind of organization in which he or she would like to work. Special classrooms have been designed for the College to facilitate the case method of instruction.

During the 1980s, the outlook for exciting careers in Business Administration is optimistic. The challenges that business faces from the effects of foreign policy, high technology, affirmative-action regulations, and new economic policies tend to create a demand for highly trained individuals equipped to analyze the complex problems of modern-day economy.

Upon completion of the Bachelor of Science in Business Administration degree, the graduate may choose to enter the work force (many former students have assumed full-time positions with former co-op employers) or go on to pursue higher degrees.

In general, students find that graduate schools view a B.S. degree in Business as solid preparation for graduate work, not only in business but also in public administration, health-care administration, and education administration. Law schools look favorably on the prelegal background obtained in business school. Although the Association of American Law Schools does not recommend particular courses or curricula for prelegal students, it does advise undergraduates to develop critical understanding of the institutions and values with which the law deals. Many careers in law are directly involved in the business world, either in large corporations or in private practice.

The College's curriculum offers students the opportunity to develop a broad understanding of the business environment, as well as to acquire the specific skills necessary to manage organizations in today's complex social and legal environment.

Honors Program

A place in the Honors Program of the College is extended to juniors and seniors who, at the end of the first quarter of their middler year, rank in the top ten percent of the class. These students are given preference in obtaining entrance to any of the College's honors seminars. They may also participate in a Senior Honors Thesis Project, an independent research project under the careful supervision and direction of a faculty member.

The Honors Program was incorporated to

- provide opportunities to bring together the best students and faculty in stimulating courses and other academic activities,
- increase the knowledge and professional skills of outstanding students,
- enhance the employment or further educational objectives of gifted students,
- develop increased respect in academic and professional communities for the College's students and programs, and
- facilitate course and curriculum experimentation into new and uncharted areas.

Any Honors Program student who completes twelve quarter hours of honors-level work at a B average or higher will receive special recognition of this achievement on both the diploma and the transcript.

Graduation Requirements

Candidates for the Bachelor of Science degree must complete all of the prescribed work of the curriculum in which they seek to qualify. This presently totals 176 quarter hours of credit. The degree conferred not only represents the formal completion of selected courses of study, but also indicates professional study in the designated area of concentration. An overall average grade of C and a C average in required courses are necessary for graduation.

Students must be enrolled in a full program of studies in the College of Business Administration during the final three quarters immediately preceding graduation.

Graduation with Honors Candidates who have achieved superior grades in their academic work will be graduated with honor. Upon special vote of the faculty, a limited number of this group may be graduated with high honor or with highest honor. Students must have been in full-time attendance in the Basic Colleges of the University at least six quarters before they can become eligible for honors at graduation.

Accreditation

The undergraduate program of the College of Business Administration is fully accredited by the American Assembly of Collegiate Schools of Business, indicating that the program meets the accrediting agency's standards for faculty and student quality, curriculum design, and overall University support.

Curriculum

The following sample freshman-year program and the basic course requirements for the College of Business Administration are the same for all concentration areas.

Sample Freshman-Year Program of Studies in the College of Business Administration

First Quarter

Introduction to Business
Fundamentals of Math
Non-Business Elective
Economics (Macro)

Second Quarter

Accounting I
Quantitative Methods in
Business
English Composition
Non-Business Elective

Third Quarter

Accounting II
 English Literature
 Non-Business Elective
 Economics (Micro)

Students who will complete the Reserve Officers' Training Corps program are permitted to drop one elective each quarter of their senior year. Individual ROTC courses carry no credit toward graduation.

The College of Business Administration has no physical education requirement. Students wishing to take courses in physical education may take a maximum of eight quarter hours as elective credits.

Basic Course Requirements

Course	Q.H.	Course	Q.H.
Fundamentals of Math	4	Introduction to Marketing	4
Quantitative Methods in Business	4	Statistics I & II	8
English	8	Introduction to Data Processing	4
Introduction to Business	4	Organizational Behavior	4
Accounting I & II	8	Complex Organizations	4
Economics (Macro)	4	Operations Management	4
Economics (Micro)	4	Business and Society	4
Introduction to Finance	4	Business Policy	4
		Non-Business Electives*	44
		Open electives	32

**For International Business majors: 8 Q.H. of this total must be from the International list.*

Accounting Concentration**Professional Preparation**

Aims If you are anticipating a career in accounting, your interests probably lie within one of its two major areas: industrial accounting and public accounting. To enable you to obtain some of the professional background necessary to enter these fields, the College of Business Administration offers a variety of financial accounting and managerial accounting courses.

Preparation for a career in accounting encompasses a broad range of activities. These include all phases of record keeping, internal and external reporting, financial planning, cost control, the design and installation of systems and procedures, the application of electronic and other modern business methods to these activities, and managerial decision making.

Accounting is a fast-growing and critical area of business. It is an exacting field that requires men and women who enjoy dealing with facts and figures as well as with people. It requires accuracy and an ability to reason and to interpret business data.

A View of the Five-Year Concentration During your first two years, you will have the opportunity to develop communicative and analytical abilities, to gain an understanding of the nature of accounting, and to survey business as a dynamic institution in an economic setting. Another important activity will be consultation with your coordinator from the Department of Cooperative Education about future work assignments.

Subjects in your third year will include courses in the various functional areas of business (marketing, finance, operations, personnel), statistical analyses, and economic activity.

Whether your choice of employment is in the industrial accounting or public accounting area, you will have the opportunity to prepare through specialized courses in your third and subsequent years. Subjects will include cost accounting, accounting theory, planning and control, auditing, and taxes.

In addition to the sample freshman-year program and basic course requirements listed on page 120, students who concentrate in accounting are required to take the following courses:

II. Professional Requirements

Course	Q.H.
Intermediate Accounting I, II, & III	12
Cost Accounting I & II	8
Accounting Theory and Practice or Accounting Planning and Control	4

Entrepreneurship and New Venture Management Concentration

Professional Preparation

Aims The concentration in Entrepreneurship and New Venture Management (Small Business Management) offers students who plan to operate their own businesses an opportunity to develop skills necessary for the effective management of small enterprises.

Description of Concentration Have you ever thought about starting, acquiring, and operating your own business? Will you be faced with an opportunity to join a family business upon graduation? Have your views of or experience with large corporations made you think about life in a smaller organization? Or do you think you would get a real kick out of working for a small company and wish to learn more about opportunities with smaller firms?

Are you considering a career in sales management, banking, public accounting, management consulting, or other areas that may involve you directly with owners and managers of new and small companies? For example, a bank loan officer, sales manager, or CPA would often have many entrepreneurs and small-company officers as clients.

If your answer to any of these questions is yes, then you are probably a member of a unique and growing portion of Northeastern students and young people everywhere whose career definition of "doing your own thing" encompasses self-employment or work in a small company or other organization.

A concentration in this field offers you a thorough "start-to-finish" perspective. The concentration provides courses that deal with each of these key questions:

1. What are the characteristics of people who start their own companies, and what does it take to start and build a new business?
2. What are some key sources of business opportunities, and how does one assess feasibility of a particular venture?
3. What sources exist for raising seed capital, and how does one acquire it?
4. What are the critical problems and opportunities in successfully managing a smaller company, and what managerial methods are appropriate to deal with these?
5. What are the key issues in financing and managing an ongoing, growing venture, and how can these be applied to small ventures?

A View of the Five-Year Concentration Courses in this concentration benefit students in several ways. They offer the opportunity to develop an ability to assess personal aptitude and potential for small business, to find and evaluate business opportunities, to secure adequate funding, and to organize and manage the various facets of the small business—marketing, finance, control, and personnel.

Entrepreneurship and New Venture Management presents students with the opportunity to prepare for a career in which they can be involved in the management of a business while maintaining a significant degree of autonomy and independence. Some students will enter this career at graduation or sometimes even before. However, many find that they obtain their first experience through cooperative work and postgraduate employment prior to establishing their own enterprises.

The freshman-year program of studies and the basic course requirements for the College of Business Administration are the same for all the concentration areas. See page 120.

II. Professional Requirements

Course	Q.H.	Course	Q.H.
New Venture Creation	4	Management of Smaller Enterprises	4
Opportunity Analysis & Venture Capital	4	Small Business Institute	
Small Business Finance	4	Field Project	8

Finance and Insurance Concentration

Professional Preparation

Aims The objective of the Finance and Insurance concentration is to train students for the financial management of businesses, nonprofit organizations, and governmental units. Preparation is twofold: students are offered *information* about current practices, theories, and concepts of financial management and have the opportunity to gain *experience* in analyzing situations that require financial decisions.

Description of Concentration Almost every phase of economic activity involves aspects of financial management—of cash or other funds and of economic resources available to the individual, the business, or other economic unit.

Perhaps you can visualize your future career in one of the many areas of funds management: security analysis, estate planning, corporate finance and control, financial planning, security or insurance brokerage, underwriting, credit management, and banking. If so, you should consider the Finance and Insurance Concentration.

There are also career possibilities in specific financial institutions that perform indispensable services for present-day business and industry. Among these are banks, insurance companies, investment houses, credit concerns, financial service institutions, mortgage companies, and national and local real estate brokerage firms and appraisers.

Career openings can be sought in all areas of business, industry, and government, where financial planning and operation are vital.

A View of the Five-Year Concentration As a middler, you will take Introduction to Finance and beginning courses in other business fields. Following the introductory course, your required courses are Managerial Finance, Investment Management, and Money and Business Activity. Besides these required courses, many electives are available, including Securities Markets, Small Business Finance, Management of Financial Institutions, and Insurance. In addition, an independent study often may be an appropriate elective.

Specialization occurs in your upperclass years as you take advanced courses in insurance, investments, security markets, and basic business finance. To provide you with a well-rounded education, other courses are available, particularly in the broad area of economics.

All courses offered by the Department of Finance and Insurance are open to students in any concentration provided they have taken the prerequisite subjects. Instructors may waive prerequisite courses in special circumstances.

Subfields

Managerial Finance The two objectives of the finance function in the contemporary corporation or business entity include:

1. Providing needed funds on terms that are the most favorable in view of current planning;
2. Regulating the flow of funds to maximize the realization of objectives.

The key concerns of financial management are the capital structure of the business and the optimal manner in which its assets should be held.

With only minor differences, these same broad objectives apply to the finance function of nonprofit organizations, including those in the public sector (units of government).

Management of Financial Institutions This area of specialization is broadly based within the subject area and is applicable to a variety of financial institutions and positions within them.

The three major topics of consideration in this area of specialization are:

1. The institutional structure of the financial system and the relation between it and the surplus and deficit units of the whole economy;
2. Asset, liability, and capital management problems of financial intermediaries;
3. Investment analysis and portfolio management policies appropriate to different financial intermediaries.

Investment and Management Analysis Two benefits result from studying this concentration. First, students can gain a general understanding, which may help them manage their own affairs. Second, those seeking professional careers in organizations where the investment function is paramount (industrial and utility corporations, real estate developments, financial institutions, and many governmental agencies are a few examples) will find this subfield of great assistance.

The concentration offers preparation in the specialized skills and principles that can benefit students who are interested in careers as investment managers or security analysts in the following organizations:

1. Stock exchanges, investment advisory firms, brokers-dealers, underwriters, mutual funds, and other investment companies that are a part of the securities markets;
2. Insurance companies, commercial banks, savings and loan associations, trust companies, mutual savings associations, and organizations involved in the activities of the securities markets; or
3. Federal and state governmental agencies such as the SEC, FDIC, Treasury Department, IRS, and others having regulatory responsibilities regarding the securities markets and their participants.

Insurance and Risk Management Risk management is the process of identifying, measuring, evaluating, and treating important risks. It is a relatively new, but growing, part of the management function in business as well as in government and other nonprofit organizations. Insurance is an important method of risk financing in all organizations, including the family unit. Some individuals may study one or a few courses in insurance and risk management to broaden their understanding of this area in order to better manage their personal affairs or to familiarize themselves with this area as part of their general management preparation. Others may wish to specialize in this area and seek careers in the risk management function in business: as managers of corporate employee benefits programs; or as managers, adjusters, or underwriters in life insurance companies, property and liability insurance companies, insurance brokerage firms, insurance agencies, independent adjusting firms; or in a number of other careers in this vast field.

The freshman-year program of studies and the basic course requirements for the College of Business Administration are the same for all the concentration areas. See page 120.

 II. Professional Requirements

Course	Q.H.	Course	Q.H.
Managerial Finance	4	Investment Management	4
Money and Business Activity	4	Finance Electives	12

Human Resources Management Concentration

Professional Preparation

Aims Human resources management, which focuses on the effective utilization of people at work, is an extension of personnel and labor relations but includes more than the traditional areas of recruitment, selection, compensation, and training. A human resources manager also must be knowledgeable about manpower planning, equal employment opportunity laws and affirmative action procedures, organizational development, career planning, job design and motivation, leadership, and communications. The ultimate goal of human resources managers is to provide an organization with the people who will be most effective in their jobs.

Description of Concentration In recent years there has been a growing interest in the quality of the employee's work life and its relation to the efficient production of goods and services. Companies such as Proctor and Gamble, AT&T, General Motors, and Burlington Mills, as well as a growing number of organizations in the public sector, are paying more and more attention to the quality of human performance at work and the level of human contributions to output. At a time when financial resources and investment capital are becoming scarcer, many organizations are beginning to take a closer look at the management of their people, their most precious resource. In recognition of this growing interest, Northeastern University's College of Business Administration offers an undergraduate concentration in Human Resources Management.

The effective management of human resources calls for a joint partnership among such organizational specialists as personnel administrators, labor relations negotiators, wage and salary analysts, and operating line managers in the various functional areas (marketing, finance, production) of the company. As the traditional role of personnel administration is expanded to include affirmative action programs, job enrichment, and organizational development activities, career opportunities in the fields of labor relations and personnel administration are likely to expand in both the public and private sectors.

For the student whose career aspirations lie in fields other than personnel and labor relations, one important point should be made: human resources management is not a specialized activity confined to the personnel department. Whether you start your career as a work-flow analyst in manufacturing, a customer service assistant in marketing, a field auditor in the accounting department, or a hospital unit manager, you will be required to demonstrate skills in working with individuals and groups to achieve desired results.

A View of the Five-Year Concentration Human resources management is practiced not only by specialists in the area of personnel and labor relations, but also by line managers and specialists in many other business areas. The Human Resources Management concentration is structured to expose students to all major functions of personnel administration and labor relations.

II. Professional Requirements

Course	Q.H.	Course	Q.H.
People and Productivity	4	Reward Systems	4
Personnel Administration	4	Human Resources Management Electives	8
Contemporary Labor Issues	4		

International Business Concentration

Professional Preparation

Aims In recent years, several factors have contributed to a rapidly increasing need for qualified people in the field of international business. The growth of multinational firms, international trade, and regional international trading blocs has created a shortage of skilled managers who are equipped to analyze the complexities of international business problems.

The International Business Administration concentration offers students the opportunity to prepare themselves to meet these management needs. It offers the opportunity to develop an understanding of problems involved in operating business enterprises across national boundaries and to develop the ability to analyze the operations of businesses in multinational environments.

The curriculum consists of: a broad education provided by course requirements in arts and sciences; a basic business education provided by business administration core requirements; and a specialized education in International Business.

Description of Concentration The International Business concentration consists of six courses. Two of them are required: Introduction to International Business and Seminar in International Business. There are also four electives: two from the International Business curriculum and two Business Electives. In addition, two of the non-business electives must be chosen from the International List (see page 128).

When you enroll in the International Business concentration, you will find that its structure is flexible, permitting you to have a dual concentration. For example, you may concentrate in International Business and use open electives to fulfill the requirement of a second concentration. The dual concentration has advantages for those seeking employment opportunities in traditional functional areas (e.g., production, marketing, finance), which also take place in an international setting. All College of Business Administration courses that are offered as part of the International Business Administration concentration are available to students in other concentrations during their middler, junior, and senior years.

A View of the Five-Year Concentration Careers in international business are best pursued in companies that carry on trade or manufacturing operations in foreign countries. An increasing number of multinational firms require that candidates for their top management positions have prior experience in international operations. In addition, large banks and insurance companies want their managers to understand international business. Other types of organizations—government, trade associations, large unions—require international business knowledge. The opportunity for foreign travel in any of these capacities is frequently available.

Students who choose this concentration have the opportunity to gain an understanding of the economic, political, and social constraints on international business and to develop skills in analyzing the financial, marketing, and operational strategies of the multinational firm.

Arts and Sciences electives such as modern languages, political science, international economics, geography, and cultural anthropology—all appropriate to the understanding of international relations—are highly recommended to complement this concentration.

The freshman-year program of studies and the basic course requirements for the College of Business Administration are the same for all the concentration areas. See page 120.

II. Professional Requirements

Course	Q.H.	Course	Q.H.
Introduction to International Business	4	Business Administration Electives (International List)	8
Seminar in International Business	4	Business Electives	8

International Electives

Business List*

- 41.160 International Accounting
- 43.261 International Marketing
- 44.160 International Financial Management
- 46.102 Comparative International Management
- 46.103 Environmental Pressures and the Multinational Corporation
- 48.110 International Transportation and Distribution Management

Non-Business List*

(Note: This is a representative listing; other Liberal Arts courses may be taken upon approval by the Area Coordinator for the International Business concentration.)

- 20.130 Language and Culture
- 20.135 Individual and Culture
- 20.140 Evolution and Society
- 20.170 Culture in Transition
- 20.250 Political Anthropology
- 20.255 Economic Anthropology
- 20.270 Social Change and Economic Development
- 21.116 Environment and Society
- 22.112 Introduction to International Relations
- 22.113 Introduction to Comparative Politics

- 22.151 Comparative Government
- 22.179 World Politics
- 22.220 The Politics of Imperialism
- 22.221 International Relations
- 22.223 American Foreign Policy
- 22.231 International Organization
- 22.233 International Law
- 23.123 Europe Since 1921
- 23.128 Modern France
- 23.129 Modern Germany
- 23.137 England Since 1900
- 23.141 Soviet Russia
- 23.145 The Modern Middle East
- 23.151 Modern Africa
- 23.170 Modern Far East
- 23.171 The Far East Since 1945
- 23.172 Recent Leaders of Asia
- 23.182 Modern European Economic History
- 23.277 Modern Latin America
- 25.222 Third World Political Relations
- 26.279 Issues in Contemporary Islam
- 27.144 Latin American Art
- 27.182 Oriental Art II
- 32.201 Spanish for Business
- 33.201 German for Business I
- 33.202 German for Business II
- 39.150 Economics of World Energy and Primary Resources
- 39.155 Superpower Economics
- 39.259 European Economic Development
- 39.261 Economic History of Less-Developed Countries
- 39.280 Comparative Economics
- 39.285 Economic Development
- 39.286 International Economics

**These courses are not offered every year. Students are advised to consult pre-registration material.*

Management Concentration

Professional Preparation

Aims Do your career interests lie in the broad area of administration rather than in specialized fields? The Management concentration offers you the opportunity to prepare yourself for a wide variety of administrative careers in business, government, and nonprofit institutions.

Description of Concentration As a Management student you must have a basic understanding of all organization functions: accounting, marketing, finance, and operations. Your courses in these areas offer you an overview of these areas, including their interrelation and the ways they can be used as management tools. For example, your study of account-

ing can be used as a helpful tool in the decision-making process, rather than as a specialty in itself. A similar approach is used in courses in other areas.

Since management is the process of getting things done through people, your professors pay significant attention to "people problems" to stress the importance of developing an effective work force.

The courses in the Management concentration vary considerably in content and method of instruction because they vary in their objectives. In most, students are heavily involved in the conducting of classes and are required to work on group assignments. The purpose of this participatory approach is to help prepare you for the demands of management in the business community.



A View of the Five-Year Concentration The curriculum and teaching methods center around the development of basic skills and knowledge appropriate to administration, rather than upon specialized functional techniques. Although the case method of study is used extensively, a variety of teaching methods consistent with particular course objectives is employed. The basic objectives of the concentration are to confront the student with appropriate learning experiences, to help increase students' skills and knowledge in basic disciplines underlying administrative practice, and to help students develop judgment and skills in organizational problem analysis and decision making.

The freshman-year program of studies and the basic course requirements for the College of Business Administration are the same for all the concentration areas. See page 120.

II. Professional Requirements

Course	Q.H.	Course	Q.H.
Cost Accounting for Management	4	Legal Aspects of Business	4
People and Productivity	4	Business Electives	12

Marketing Concentration

Professional Preparation

Aims A business organization not only designs and manufactures products, but also markets and sells them to manufacturers, wholesalers, retailers, and consumers. This is what a concentration in marketing is all about.

Description of Concentration All the business activities that direct the flow of goods and services from producer to consumer are classified as marketing concerns. The marketing process begins by determining the needs and wants of customers. Once these wants and needs are established, the organization's first objective is to produce goods or services to satisfy a particular consumer. Essential in all types of business are such activities as product design, research, pricing, packaging, transportation, advertising, selling, and servicing. The overall responsibility for these functions rests with the marketing manager.

The Marketing Concentration offers a wide variety of courses, taught by lecture and class discussion. Included are such courses as Marketing Management, Advertising, Sales Management, Consumer Behavior, and Competitive Strategy.

A View of the Five-Year Concentration Outside the classroom, students may attend weekly meetings of the American Marketing Association Student Chapter, through which they may further their interests by discussing issues with leaders in the field.

Without successful marketing and advertising, industrial products remain unsold. More and more companies are finding that today's tempo of progress and high levels of production require up-to-date marketing techniques to generate a higher sales volume.

As members of the management policy group, marketing executives take a broad view of all aspects of business management and policy. They also serve effectively as trained specialists in their own areas.

Success in the market is vital to every company, whatever its size. Therefore, the need for adaptable and informed marketing management exists in all types of business and industry.

The freshman-year program of studies and the basic course requirements for the College of Business Administration are the same for all the concentration areas. See page 120.

II. Professional Requirements

Course	Q.H.	Course	Q.H.
Marketing Management	4	Competitive Strategy	4
Marketing Research	4	Marketing Electives	12

Transportation and Physical Distribution Management Concentration

Professional Preparation

Aims Transportation is an integral part of national and international distribution systems. It is a determining factor in the availability and prices of goods and services in our economy.

In corporate distribution, transportation specialists operate within a complex organizational framework in which goods are stored and moved. Effective management of this distribution process involves understanding inventory control, warehousing, transportation options, and the interaction of these activities with other functional operations.

Growing concern with the economic and service conditions of the transportation industry has also created career positions with government agencies engaged in transportation policy development and administration. Other career possibilities are to be sought with carriers such as airlines, railroads, and trucking companies, which actively seek people who are familiar with the operational and regulatory aspects of their business.

The Transportation and Physical Distribution Management concentration offers students opportunities to prepare for these diverse career opportunities.



Description of Concentration The concentration offers the student a balanced background in Transportation and Physical Distribution Management. Courses consider not only the viewpoint of the corporate shipper and carriers, but also those of public officials, in addition to consumer interests. Courses have a strong contemporary orientation and promote frequent interaction with practitioners from business and government.

A View of the Five-Year Concentration Course offerings in Transportation and Physical Distribution Management are sequential so that students who desire only an introductory exposure may take one or several courses as part of a broader business background. An undergraduate concentration in the area consists of six courses. Four are required courses, with the balance of the concentration composed of electives.

The freshman-year program of studies and the basic course requirements for the College of Business Administration are the same for all the concentration areas. See page 120.

II. Professional Requirements

Course	Q.H.	Course	Q.H.
Principles of Transportation	4	Seminar in Transportation	4
Physical Distribution Management	4	Transportation Electives	8
Current Issues in Transportation Policy	4		

Non-Concentration (Self-Designed)

Professional Preparation

Aims Because innovation and relevance are key words in the College of Business Administration, the Non-Concentration curriculum is adaptable to each student's needs. Meeting with an academic adviser, you tailor your academic program to meet your own career goals.

Description of Concentration Students will be required to select a total of at least six business electives beyond the basic course requirements.

The freshman-year program of studies and the basic course requirements for the College of Business Administration are the same for all the concentration areas. See page 120.

College of Computer Science

Paul M. Kalaghan, Ph.D., *Dean*

Professors

Arthur C. Allison, Ph.D.
Richard A. Rasala, Ph.D.

Associate Professors

John Casey, B.A.
Agnes H. Chan, Ph.D.
Harriet J. Fell, Ph.D.
Graham H. Norton, Ph.D.
Betty J. Salzberg, Ph.D.

Assistant Professors

Paul R. Holley, M.S.
Viera K. Proulx, Ph.D.
Michael Weiss, Ph.D.

Instructor

Lawrence A. Bookman, M.S.

Professional Preparation

The College of Computer Science offers students the opportunity to concentrate in the broad field of computer science. The program is designed for men and women who are seeking to prepare themselves for productive careers in industry, government, or other organizations that design, develop, market, or utilize computing systems. A fundamental goal of the College is to help students develop the ability to recognize and solve problems arising in the use of modern digital computers in business and engineering as well as in educational and research environments.

In developing the skills necessary to achieve this goal, the student has the opportunity to assimilate ideas and concepts from theoretical studies; in-depth, hands-on programming of both large time-sharing systems and single-user microcomputers; and practical insight gained from the cooperative education experience.

The concentration in Computer Science is offered primarily on the five-year Cooperative Plan because of the inherent value of experience gained in an actual computer-oriented working environment.

Aims Recognizing that the advance of technological innovation casts the computer in ever-widening roles and brings the concept of the "information society" closer to reality, the College has adopted the following aims:

1. to understand the scientific principles that serve as the foundation of computer science;
2. to develop the habits of accurate thinking that are essential to the description and efficient analysis of computer-related problems;
3. to cultivate an awareness of the common features and mathematical bases of a wide variety of computational issues arising in apparently unrelated information-processing applications.
4. to communicate ideas and approaches in a clear and concise manner in a style appropriate to the audience;
5. to maintain an adequate awareness of the pace of information technology in order to lead innovation rather than follow it.

A View of the Five-Year Program Although students of computer science concern themselves, on the surface, with the languages used in writing computer programs, their involvement in the study of software design goes much deeper. Students have the opportunity to study the application of computers to many fields and to consider various approaches to storing maximal amounts of information in a system's storage devices and minimizing the time it takes to retrieve that information. How to select the best computer system for a particular application is of concern. Since errors can accumulate in computer calculations, comput-

er science students are also expected to study ways in which such errors can be detected and minimized. A newly emerging topic is the methodology of program structure and design—a concern directed at determining the best approach to organizing large problems so that the chance for error, the difficulty of detecting an error, and the cost of correcting an error are minimized.

The Computer Science Program is designed in accordance with the recommendations of two large, national professional societies—the Association for Computing Machinery and the Mathematics Association of America. It offers a well-rounded and flexible program in which students are expected to fulfill certain minimum course requirements but are provided an unusually wide selection of electives from which to choose. In this way, students have the chance to plan a program of study according to the particular fields of computer applications most interesting to them.

Sample Program for Bachelor of Science in Computer Science

First Year

Quarter 1

10.150	Calculus I	4
*11.117	Physics I	4
06.100	Comp. Sci. I	4
30.113	English	4

Quarter 2

10.151	Calculus II	4
*11.118	Physics II	4
06.101	Comp. Sci. II	4
30.114	English	4

Quarter 3

10.152	Calculus III	4
*11.119	Physics III	4
	Soc. Sci./Hum. Elec.	4
09.140	Appl. Prog.	4
06.110	Prog. Lang. Lab.	1

Second Year

Quarter 4

10.153	Calculus IV	4
06.130	Assembly Lang. I	4
06.201	Data Structures	4
	Soc. Sci./Hum. Elec.	4
06.111	Prog. Lang. Lab. II	1

Quarter 5

10.210	Discrete Math.	4
06.131	Assembly Lang. II	4
03.191	Comp. Org. & Des. I	4
	Soc. Sci./Hum. Elec.	4
06.112	Prog. Lang. Lab. III	1

Third Year

Quarter 6

10.246	Linear Algebra	4
06.220	File Processing	4
03.192	Cmp. Organ. & Des. II	4
	Coordinated Study	4

Quarter 7

**05.145	Probability	4
06.230	Operating Systems	4
	Coordinated Study	4
	Soc. Sci./Hum. Elec.	4

Fourth Year

Quarter 8

**05.147	Statistics I	4
06.240	Analysis of Prog. Lang.	4
06.250	Automata & Formal Lang.	4
	Soc. Sci./Hum. Elec.	4

Quarter 9

06.260	Compiler Design I	4
06.265	Analysis of Algorithms	4
	Coordinated Study	4
	Soc. Sci./Hum. Elec.	4

Fifth Year**Quarter 10**

†	Comp. Sci. Elective	4
	Coordinated Study	4
	Coordinated Study	4
06.291	Comp. Sci. Project	4

Quarter 11

	Coordinated Study	4
	Coordinated Study	4
	Soc. Sci./Hum. Elec.	4
06.295	Comp. Sci. Seminar	4

*Students with a very strong interest in life science may be allowed to substitute 12.127–12.129 or 18.131–18.133 if schedule permits. 11.203, 204, 205 substituted for 11.117, 118, 119 for 1980–81 academic year.

**Students interested in the theoretical aspects of computer science should substitute 10.208 and 10.220.

† 06.280 Artificial Intelligence, 06.210 Computer Graphics, or 06.225 Data Base Management.

On balance, the program offers a strong foundation in mathematics and a variety of program design and analysis courses. The requirement for seven quarters of social science/humanities electives provides opportunity for students to broaden their horizons and to obtain a cultural context in which to imbed the technical concepts of computer science.

Awarding of Degree

The Bachelor of Science in Computer Science degree is conferred by the College of Computer Science.

College of Criminal Justice

Norman Rosenblatt, Ph.D., *Dean*

Robert D. Croatti, *Associate Dean*

Lester W. McCullough, Jr., *Assistant Dean*

Robert E. Fuller, *Assistant to the Dean*

Kathleen M. Higgins, *Coordinator of Educational Services in Forensic Science*

Professors

Romine R. Deming, Ph.D.

Theodore N. Ferdinand, Ph.D.

Edith E. Flynn, Ph.D.

Robert R. J. Gallati, S.J.D.

Joseph J. Senna, M.A., D.Jur.

Robert Sheehan, M.A., D.Jur.
(Honorary)

Associate Professors

James A. Fox, Ph.D.

Nicole F. Rafter, Ph.D.

Assistant Professors

John H. Laub, Ph.D.

Frank A. Schubert, D.Jur.

Wallace W. Sherwood, L.L.M.

Professional Preparation

Aims Established in 1966 under a grant from the Ford Foundation, the College of Criminal Justice offers its students the opportunity to prepare for professional careers in the fields of criminal justice and private security; through its prelegal studies concentration, many students also eventually enter law school. The curriculum has been designed to offer students a broad academic foundation upon which to base a professional concentration of courses which introduce students to specific career areas. Prelegal studies, law enforcement, private security, corrections, probation and parole, and forensic science are some of the areas of interest pursued by students. It is also expected that a number of graduates will choose advanced study in academic fields such as criminology, forensic science, social work, public administration, and law, as well as in the entire area of criminal justice.

The College was founded to help prepare students to enter professions that deal with some of the most important social issues of our times. To deal with these issues and to help prepare graduates for careers that are rewarding and beneficial, innovative methods and ideas, as well as the most advanced thinking, are utilized by the College of Criminal Justice. As a reflection of its significant role in higher education, the College has received substantial grants from the Department of Justice and was designated both as a training center in criminal justice and as a center of education and innovation in the field of criminal justice and forensic science.

A View of the Five-Year Program The College of Criminal Justice offers a five-year academic program on the Cooperative Plan of Education, which allows a candidate for the baccalaureate degree to undertake a specialized program of study. It is anticipated that co-op assignments may include work in parole or probation offices, law firms, police departments, private security agencies, public or private institutions, social agencies, planning and evaluation units, or other areas related to the criminal justice program.

Students are offered a broad educational background for future roles in criminal justice. Because students are preparing for careers involving the social problems of people from all walks of life, course work in the social sciences, behavioral sciences, and the humanities is integrated with professional courses. The liberal content of the curriculum is highly desir-

able not only for its value as a foundation upon which general intellectual development may be based, but also as an indispensable educational requirement for professional service in the criminal justice field.

Graduates must be prepared to judge objectively the many socioeconomic problems inherent in the administration of justice in contemporary American society. The College of Criminal Justice helps to prepare students for a career that will be not only personally productive and rewarding, but intellectually stimulating as well.

Graduation Requirements

Candidates for the Bachelor of Science degree must complete all the prescribed work of the curriculum, a total of 172 quarter hours of credit.

Students who undertake the Cooperative Education Program must meet the requirements of the Department of Cooperative Education before they become eligible for their degrees.

No student transferring from another college or university is eligible to receive a degree until at least one year of academic work immediately preceding graduation has been completed at Northeastern.

Graduation with Honors

Candidates who have achieved superior grades in their academic work will be graduated with honors. Upon special vote of the faculty, a limited number of this group may be graduated with high honors or with highest honors. Students must have been in attendance at the University for at least six academic quarters before they become eligible for honors at graduation.



Sample Freshman-Year Program of Studies in the College of Criminal Justice

First Quarter

English
Economics
Introduction to Sociology
Critical Issues in Criminal Justice

Second Quarter

English
Foundations of Psychology
Introduction to Politics
Critical Issues in Criminal Justice

Third Quarter

Economics
Foundations of Psychology
Introduction to American Government
Administration of Criminal Justice

In addition to the above courses, students may elect to take Basic ROTC.



Basic Course Requirements

I. General Requirements

Course	Q.H.	Course	Q.H.
Principles and Problems of Economics*	8	Introduction to Sociology*	4
Introduction to Politics*	4	Freshman Writing*	4
Introduction to American Government*	4	Introduction to Literature*	4
Foundations of Psychology I & II*	8	State and Local Government†	4
		Western Civilization	8
		Science or Math†	8
		Non-CJ Electives (13)	52

II. Professional Requirements

Course	Q.H.	Course	Q.H.
Administration of Criminal Justice*	4	Constitutional Problems†	4
Criminology†	4	Criminal Justice Research	4
Criminal Law†	4	Criminal Justice Electives (11)	44

*Courses are usually taken in the freshman year.

†Courses are usually taken in the sophomore year.

College of Engineering

Harold Lurie, Ph.D., *Dean*

Ralph S. Blanchard, M.S., *Associate Dean*

John G. Proakis, Ph.D., *Associate Dean and Director of
the Graduate School*

David C. Blackman, M.S., *Assistant Dean and Director of
Minority Affairs*

Bradford C. Perry, M.Ed., *Director of Student Services*

Professional Preparation

The College of Engineering prepares students to participate constructively in a technologically changing world, thus contributing as professional engineers to the accumulation and application of new knowledge. Fundamentals are emphasized, thus offering students the opportunity to obtain the basic technical knowledge necessary to practice in a variety of positions. At the same time, study of the social sciences and humanities provides an awareness of the social, economic, political, aesthetic, and philosophical influences that are part of the context in which students will practice their professions.

Aims The concept of education as a continuing, lifelong process necessary for effective work in an environment of constantly new facts, ideas, and scientific principles underlies the whole structure of the engineering curriculum.

Engineering education is directed toward assisting students to:

1. Understand the scientific principles and knowledge of a particular branch of engineering selected;
2. Comprehend and develop competence in the engineering method and its application;
3. Communicate effectively and succinctly the important results of any technical study both verbally and graphically;
4. Acquire the motivation for continuing professional growth.

Day Cooperative Programs

The College offers five-year cooperative programs in Civil, Mechanical, Electrical, Chemical, and Industrial Engineering leading to the degree of Bachelor of Science with specification according to the engineering department in which the student qualifies. The College also offers a General Engineering Program, which leads to the awarding of an unspecified Bachelor of Science degree, through which students have the opportunity to design a curriculum suited to their objectives. The various curricula offer students the opportunity to prepare effectively for employment in industry or postgraduate study.

Under the six programs, several options or specialized concentrations are available:

Electrical Engineering—Power Systems Option To meet the needs of the rapidly expanding electric power industry, Northeastern has a special program in Power Systems Engineering. This program is offered on the Cooperative Plan and can lead to both a bachelor's and a master's degree in six years. The subject matter is basically that of electrical engineering augmented by work in power systems analysis, computers in power systems, nuclear plant considerations, power system planning, protection and stability, and MHD and DC transmission.

Civil Engineering—Environmental Option This option is designed for engineering students intending to work in the field of environmental protection and improvement. Topics included at the undergraduate level are water supply, treatment and wastewater disposal, solid waste disposal, and air pollution. The cooperative program, leading to a bachelor's degree in civil engineering in five years, offers students the opportunity to enter immediately a professional practice in government agencies, industry, or private consulting firms, depending on the job market as well as their own industry and abilities.

Computer Studies The computer, virtually nonexistent thirty years ago, has spawned several of the fastest-growing professions in the world. The demands for people educated in the design and use of computers have reached unprecedented levels in recent years.

Under Electrical Engineering, the Computer Engineering option is concerned with the design of digital computers and their integration within larger systems for communications, resource management, and automatic control. The computer engineering team for a large computer-system development project includes computer architects, software engineers, microprogrammers, logic designers, and electronics engineers. On the other hand, the computer engineer may have sole responsibility for all of these activities during the development of a microprocessor-based instrument or controller. Further details on this program are discussed on page 148, in the section devoted to the Department of Electrical and Computer Engineering.

Graduate programs of study in Computer Science and in Information Systems are offered by the Departments of Electrical and Computer Engineering and Industrial Engineering. These programs are described fully in the Graduate School of Engineering catalog, which can be obtained by writing to the School's director at 409 Churchill Hall.



Five-Year BS/MS Programs

Several majors (Electrical, Mechanical, and Industrial Engineering) offer programs leading to both the Bachelor's and Master's degrees in five years. Students with outstanding academic records (3.0 or better) may begin carrying extra courses in the third year. In the senior year, these students forgo one cooperative work quarter and attend school full time to complete the course requirements for both degrees.

Part-time Program Offered During Evening Hours

The College of Engineering also offers an eight-year, part-time curriculum leading to the degree of Bachelor of Science in Electrical, Mechanical, or Civil Engineering. Classes are held in the evening. Admission and course requirements are the same as for the degree program offered under the Cooperative Plan. For further information, consult the evening bulletin of the College of Engineering, or call the Dean of Engineering's office.

General

Description of Programs

The undergraduate academic program begins with three quarters of full-time study. Course work during the first year helps to build students' understanding of mathematics and the physical sciences and to improve their ability to communicate ideas both verbally and graphically. The freshman courses act as a foundation for upperclass studies and assist students in developing basic understanding of concepts in the engineering sciences and introduce them to the engineering method and its application. About four-fifths of the upperclass program is devoted to scientific and technological study, and about one-fifth to humanistic-social courses, with the aim of balancing the students' growing technical proficiency with an appreciation of the nontechnical aspects of society and culture.

Cooperative work in the chosen branch of engineering begins upon completion of the freshman year and continues throughout the remaining upperclass years. The work assignments during this time may be most valuable in helping to integrate the important elements of both an engineering and a liberal arts education. They can also be instrumental in teaching the value of teamwork while, at the same time, helping the student to acquire insight into the problems of actual engineering practice.

Graduation Requirements

Degrees The College awards the Bachelor of Science degree in Chemical, Civil, Electrical, Industrial, and Mechanical Engineering, as well as the Bachelor of Science degree without specification.

Qualification for Degrees Candidates for the Bachelor of Science degree must complete all of the prescribed work of the curriculum in which they seek to qualify with no academic deficiencies. Students who undertake cooperative work assignments must complete a minimum of four quarters of cooperative work experience approved by the Department of Cooperative Education.

Students transferring from another college or university are not eligible to receive the Bachelor of Science degree until they have completed at least one academic year at Northeastern immediately preceding their graduation.

Graduation with Honors

Candidates who have attained superior grades in their academic work will be graduated with honors. Upon special vote of the faculty, a limited number of this group may be graduated with high honors or with highest honors. Students must have been in attendance at the University at least six quarters before they may become eligible for honors at graduation.

Accreditation

All undergraduate day programs with specification, offered solely by the College of Engineering, as well as the part-time evening program in Civil and Electrical Engineering, are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET) (formerly the Engineer's Council for Professional Development).

Women in Engineering

Recognizing its opportunities, more women are entering the field of engineering every year. Aware of their qualifications and potential, industry and government provide positions of responsibility for competent women engineers. Any woman with scientific or technical interests should consider the many possibilities offered in engineering.

Women currently account for almost 10 percent of engineering freshmen. Women in engineering are represented with a chapter of the Society of Women Engineers, which offers a full schedule of technical and professional programs.

Minorities in Engineering

Through its Progress in Minorities in Engineering (PRIME) program, the College seeks to expand educational opportunities for qualified blacks, Puerto Ricans, Mexican-Americans, and American Indians. It can provide scholarships based on merit and/or need. Every effort is made to provide enough aid so that outside work is not necessary during the freshman year. Guidance counseling and tutorial services are among the support services provided by the program.

For more details, contact David C. Blackman, Assistant Dean, Minority Affairs; 400 Churchill Hall, Northeastern University, Boston, Massachusetts 02115.

Sample Freshman-Year Program of Studies in Engineering

The freshman-year program of studies in the College of Engineering is the same for all designated majors in the College except Computer Science.

First Quarter

FORTTRAN Programming
Calculus
Physics
English

Third Quarter

Calculus
Physics
General Chemistry
English

Second Quarter

Graphics and Design
Calculus
Physics
General Chemistry

The first-year pattern of two-term courses may vary according to assigned section.

In addition to the above courses, students may elect to take Basic ROTC.

Chemical Engineering Department

Elizabeth M. Drake, Sc.D., *Cabot Corporation Professor and
Chairperson*

Professor

John A. Williams, Ph.D.

Instructor

Huei Luo, M.S.

Associate Professors

Ralph A. Buonopane, Ph.D.

Bernard M. Goodwin, Sc.D.

Richard R. Stewart, Ph.D.

Professional Preparation

Aims Since the field of chemical engineering is so varied, the program of study has been designed to offer students broad training in which fundamental principles are stressed, thus providing them with the opportunity to develop the ability to acclimate themselves readily to graduate school or to an industry of their choice. The faculty stresses the principles of environmental control, conservation, and technology assessment to emphasize the importance of the engineer's role in society.

Description of Major The chemical engineer has been defined as a "professional experienced in the design, construction, and operation of plants in which materials undergo chemical and physical change." It is the task of the chemical engineer to reduce the costs, increase the production, and improve the quality of the products in the industry.

Chemical engineering has grown out of discoveries in the chemical laboratories which have served as a foundation for a great many new industries whose production processes involve chemical as well as physical changes.

Petroleum refining, plastics, manufacture of synthetic fibers, and hundreds of other industries require men and women trained in chemistry as well as in engineering. Moreover, much of the training received by the chemical engineer is now being applied to the rapidly developing fields of nuclear engineering, energy, space engineering, and environmental controls. In order to benefit mankind by *not* contributing to pollution or waste of resources, many older industries, such as foods, textiles, paints and varnishes, and leather, are also employing chemical engineers.

A View of the Five-Year Major After students have taken the fundamental courses in chemistry, mathematics, and physics, required of all engineering students, they may go on to advanced courses which apply these fundamentals to the solution of engineering problems. These upperclass courses are a skillful blend of the latest mathematical and theoretical analyses with the practical aspects of the profession.

Chemical engineering is one of the fastest-growing major fields of engineering. Tremendous growth is occurring in research and development, especially in such fields as petroleum and chemicals (about one-third of all chemical engineers are employed in these fields).

Accreditation

The Department is accredited by the American Institute of Chemical Engineers as well as by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET).

Laboratories

The chemical engineering laboratories are designed to acquaint the student with the experimental approach to the solution of engineering problems and to develop research interests. Graduate research may be conducted in such areas as energy, environmental, photoreactions, process control, mathematical modeling, and computer applications.

Students are first exposed to the basic measurements in engineering in experimental methods laboratories, with emphasis on temperatures, pressure, and flow rate. Following this, they are given problems involving such areas as transport properties, kinetics, thermodynamics, and process dynamics, which they must solve experimentally. They are required to design and conduct the experiment, reduce the data using computers, and write a final report. Students use pilot-scale chemical engineering equipment in the experiment, when applicable.

The freshman-year program of studies in the College of Engineering is the same for all majors in the College. See page 141.

Basic Course Requirements

I. General Requirements

Course	Q.H.	Course	Q.H.
English*	8	Physics†	4
General Chemistry*	8	Physics Lab†	2
Physics*	12	Calculus†	8
Calculus*	12	Mathematical Analysis	8
Engineering Graphics*	4	Economics	8
Computers for Engineering*	4	Social Science/Humanities	
		Electives (4)	16

II. Professional Requirements

Course	Q.H.	Course	Q.H.
Organic Chemistry†	8	Experimental Methods	8
Physical Chemistry	8	Chemical Engineering	
Chemical Engineering		Thermodynamics	4
Calculations†	8	Chemical Engineering	
Polymer Science and		Kinetics	4
Engineering†	4	Process Design or	
Transport Phenomena	8	Research Project	12
Chemical Engineering	8	Chemical Engineering	
		Electives (4)	16

*These courses are usually taken in the freshman year.

†These courses are usually taken in the sophomore year.

Civil Engineering Department

Jerome J. Connor, Jr., Sc.D., *William Lincoln Smith Professor and Chairman*

Professors

Reginald L. Amory, Ph.D.
Frederic C. Blanc, Ph.D.
John J. Cochrane, Ph.D.
Constantine J. Gregory, Ph.D.
Kenneth M. Leet, Sc.D.

Associate Professors

Leroy M. Cahoon, M.S.
Walter E. Jaworski, Sc.D.
Michael Kupferman, Ph.D.
Robert L. Meserve, M.S.
Saul Namyet, B.S.
Hormoz Pazwash, Ph.D.
James C. O'Shaughnessy, Ph.D.
John G. Schoon, Ph.D.
Richard J. Scranton, M.S.
Barbara M. Taylor, Ph.D.
Irvine W. Wei, Ph.D.
Mishac K. Yegian, Ph.D.

Assistant Professors

Menashi D. Cohen, Ph.D.
Peter G. Furth, Ph.D.
Duc T. Nguyen, Ph.D.

Instructors

George H. Brattin, M.S.
Gregory P. Broderick, M.S.
Peter K. Hadley, M.S.
Irwin Silverstein, M.S.

Professional Preparation

Aims Students in the Civil Engineering Department have the opportunity to prepare themselves for a professional career in one or several of the areas into which the field is traditionally divided: structures, environmental (water supply, wastewater disposal, air pollution), transportation, soil mechanics and foundations, and construction. A major aim of the program is to provide students with the opportunity to acquire a fundamental, flexible, and rigorous engineering education so that, in view of inevitable change within the field, graduates will be in a position to build continuously on their basic knowledge.

The civil engineer cannot function solely within the requirements of a construction project or a client's interest. Engineers must address themselves to the broader considerations of the rights of all those affected by their planning decisions or proposed construction. In view of the growing problems of urban overpopulation, energy shortage, and pollution—and the increased social awareness of concerned individuals—another major aim of the program is to help the student gain a broader perspective of the world, of society, and of the individual. A wide range of electives in the humanities, social sciences, and basic sciences encourages students to investigate areas outside their specific technical focus and to extend their personal interests and involvements.

A View of the Five-Year Major The five-year study curriculum is divided into eleven quarters of school and eight quarters of cooperative work assignments. The work phase is designed to allow the student to gain insight into all types of activity normally confronted by the civil engineer. Thus, the well-motivated student can determine from these work experiences what further course work preparation will be required to become successful as a practicing civil engineer. The work experience also may be valuable in stimulating a certain amount of self-support and independence.



The first years of the curriculum are, for the most part, devoted to the fundamentals of math, basic sciences, and engineering that comprise the foundation for later professional studies. The final years are devoted to a range of professional subjects, both required and elective. Guidance from a faculty adviser is available throughout the academic program.

The curriculum is thus intended to offer a firm educational background for students preparing for a career in the design and construction of structures, transportation systems, and environmental systems as civil engineers.

Upon completion of the requirements for the Bachelor of Science in Civil Engineering degree, the graduate may choose to enter the engineering profession or to go on to graduate school for advanced training. The beginning civil engineer will probably find that graduate course work is a prerequisite for advancement.

During the first period of employment as a graduate, the civil engineer may expect to spend some time in the field or the office in work involving design computations, layout work and supervision of construction, or obtaining and analyzing information for studies and reports. With increased experience, the graduate will be better prepared to take on greater challenges and more responsibilities.

Graduates normally seek employment at municipal, state, and federal agencies and in private consulting practice, general construction, and industry.

Part-Time Program

The Civil Engineering Program is also available on a part-time basis. The classes are scheduled during the evening hours, usually two evenings per week. The curriculum can be completed in a minimum of eight years.

Transfer programs for qualified students with Associate degrees or Bachelor's degrees in Civil Engineering Technology can be arranged in either the day co-op or the part-time programs.

Student Professional Society

Our Student Chapter of the American Society of Civil Engineers is very active. In addition to traditional activities, which include sponsoring weekly professional speakers and occasional field trips to civil engineering construction sites and constructed facilities, members have successfully completed several significant community-service projects valued at approximately a quarter of a million dollars.

The students have developed and designed innovative and educational outdoor play exhibits illustrating both natural and man-made phenomena for the Children's Museum of Boston. They have participated, in conjunction with the Southwest Corridor Community Farming Project, in the design and construction of a solar-heated greenhouse. They have worked with staff members of the Joseph P. Kennedy, Jr., Memorial Hospital for Children in the planning, designing, financing, and construction of a special playground for handicapped children. They have designed and constructed an outdoor amphitheater for the Salvation Army's Camp Wonderland, and performed an investigation of fire evacuation procedures and building modifications for the Cotting School for the Handicapped. Each year, at least one such community-service project is undertaken.

In recognition of these unusual efforts, our Student Chapter has been designated as the "single most outstanding" chapter in the nation and consequently has received the Robert Ridgway Award of the American Society of Civil Engineers for an unprecedented five consecutive years.

Computer Facilities

The Civil Engineering Department makes use of a variety of computer facilities to complement course work and research. Direct access to the University's computer is available through numerous remote terminals. In addition, two minicomputers are housed in the Department: a Hewlett Packard System 45 with interactive graphics and a Digital LSI-11. All systems are supported with sophisticated software packages with applications to all the disciplines of civil engineering.

Laboratories

Soil Mechanics Laboratory The soils laboratory is equipped to perform the full spectrum of soils tests, as well as to conduct model studies.

A wide variety of laboratory equipment permits students to perform tests ranging from those related to soil classification to sophisticated triaxial tests that are required to evaluate the stress-strain properties of a soil specimen. The triaxial tests can be of strain-controlled loading, stress-controlled loading, or a combination thereof. Pore-pressure measurements are made either electronically with pressure transducers or manually with null-pressure indicators.

Consolidation-test equipment of various load ranges and types is available. Consolidation tests applying loads up to 50 tsf on the sample are possible. The laboratory is equipped with a wide range of electronic devices, including pressure transducers, load cells, and accelerometers to expedite data collection.

Research with the aid of models can be conducted to study the problems associated with the design and construction of earth dams, open-braced cuts, and other similar structures. In addition, model studies on the behavior of footings or piles are possible for both static and cyclical loading conditions.

Water-Quality Laboratory Capabilities include analyses of both water and wastewater samples in physical, chemical, and biological regimes. Laboratory and supporting equipment enable complete studies in the following areas: water analysis, wastewater analysis, trace-metal and organic analysis, stream and estuary studies, waste-treatability studies, unit operations, bioassay techniques, pilot plant studies, tracer studies, and complete instrument analysis.

Instrument analysis capabilities include atomic absorption, total carbon, organic carbon, specific ions, gas chromatography, spectrophotometric, and gravimetric analyses.

Special areas are available for unit operation studies in water and wastewater treatment. A well-equipped machine shop has been established so that special equipment can be designed and built for model-prototype studies.

The Gillette Environmental Research Laboratory is available for research and development work in connection with the program in Environmental Engineering and Science.

Air Pollution Laboratory Equipment is available to sample ambient air and gaseous and particulate pollutants and to evaluate the physical, chemical, and biological characteristics of atmospheric pollutants. Continuous air samples may be established in any area in Metropolitan Boston and the samples analyzed by ultraviolet-visible, fluorescence, and atomic spectrophotometry, as well as gas chromatography and infrared

techniques. A portable carbon-monoxide analyzer with printout equipment is available for measurement studies and research work. Research in air pollution problems is a continuing project.

Recent equipment additions also make it possible to conduct studies in noise pollution.

Basic Course Requirements

I. General Requirements

Course	Q.H.	Course	Q.H.
English*	8	Physics†	4
Calculus*	12	Physics Lab†	2
Basic Engineering*	8	Economics	8
Physics*	12	Math	8
Chemistry*	8	Public Speaking	2
Calculus†	8	Social Science/ Humanities Electives (5)	20

II. Professional Requirements

Course	Q.H.	Course	Q.H.
Thermodynamics†	4	Professional Electives— 7 required	
Engineering Measurements†	6	Civil Engineering Systems	4
Structural Mechanics†	8	Structural Analysis II, III	8
Dynamics	4	Structural Design II	4
Materials	4	Concrete Design II	4
Fluid Mechanics	4	Hydraulic Engineering	4
Electrical Engineering	4	Geotechnology	4
Soil Mechanics (w. Lab.)	6	Foundation Engineering	4
Environmental Engineering I	4	Transportation Analysis and Planning	4
Concrete Design I	4	Applied Probability Theory for Civil Engineering	4
Structural Design I	4	Environmental Engineering II, III	8
Structural Analysis I	4	Environmental Design	4
		Air Pollution	4
		Statistics	4
		Engineering Economy	4
		Construction Engineering	4
		Highway Engineering	4
		Structural Mechanics III	4
		Technology Assessment	4
		Legal Aspects of Civil Engineering	4

*Usually taken in the freshman year.

†Usually taken in the sophomore year.

The freshman-year program for the College of Engineering is the same for all majors in the College. See page 141.

Electrical and Computer Engineering Department

J. Spencer Rochefort, M.S., *Professor and Chairman*

Professors

Basil L. Cochrun, M.S.
Ladislav Dolansky, Ph.D.
James M. Feldman, Ph.D.
Kenneth I. Golden, Ph.D.,
George A. Snell Professor
Robert A. Gonsalves, Ph.D.
Arvin Gabel, Sc.D.
Martin E. Kaliski, Ph.D.
John G. Proakis, Ph.D.
Harold R. Raemer, Ph.D.
Wilfred J. Remillard, Ph.D.
Sheldon S. Sandler, Ph.D.
Mulukutla S. Sarma, Ph.D.
Martin E. Schetzen, Sc.D.
Walter C. Schwab, Ph.D.
Michael B. Silevitch, Ph.D.
Robert D. Stuart, Ph.D.

Associate Professors

Marcello J. Carrabes, M.S.
J. Duncan Glover, Ph.D.
Richard E. Grojean, M.S.

Wayne G. Kellner, Sc.D.
Robert J. Lechner, Ph.D.
Walter H. Lob, M.S.
Robert N. Martin, M.S.
Louis Nardone, M.S.
Sheila Prasad, Ph.D.
Michael Rudko, Ph.D.

Assistant Professors

Elizabeth E. Ames, Ph.D.
Amir Farhat, Ph.D.
Vinaykumar Ingle, Ph.D.
Robert Jackson, Ph.D.
Kaveh Pahlavan, Ph.D.
William Rutz, Ph.D.
David G. Wimpey, Ph.D.

Instructors

Charles M. Aoun, M.S.
George E. Assaf, M.S.
Abdollah Ataie-Norghab, M.S.

Professional Preparation

Aims Among their many achievements, electrical engineers have been primarily responsible for the development of the computer, integrated circuits, the pacemaker, satellite communication, space navigation, microprocessors, television, and the means of providing the energy needed to run our cities and our industries. At present, electrical engineers are working to help find solutions to the problems of information transfer and management, industrial productivity, energy conservation and alternative energy sources, transportation, and health care.

This is just a small sample of the growing wealth of evidence that indicates that electrical engineering has impact on all facets of our culture. As with all branches of technology, the societal functions and aims of electrical engineering are to maintain and improve the quality of life.

Description of the Major Despite the diversity of its application, electrical engineering may be conveniently divided into two broad, general areas of information sciences and energy resources. The area of information sciences is concerned primarily with systems whose function is computation, communication, or control. Included in this area are the circuits and devices that comprise the systems and the application of the systems and engineering techniques to other disciplines. Energy resources deal with problems related to the sources, generation, and distribution of large quantities of electrical energy. It should be noted, however, that no rigid boundary exists between the two areas, and many of the technical specialties within electrical engineering are applicable to both areas.



Many electrical engineers are involved with the more traditional activities of system design and development, such as the information sciences or energy resources area. Other electrical engineers apply the knowledge gained in their professional education to such disciplines as ocean exploration, meteorology, experimental psychology, electronic music, health-care systems, bioelectronics, and educational devices for the disadvantaged.

The optimistic outlook for electrical engineering is based on the breadth of the technical activity described above. We are constantly reminded that among the pressing problems in our society are improvement of industrial productivity, the energy crisis, data communication and management, urban transportation, health care, and the plight of the socially and physically disadvantaged.

No one has yet been able to forecast how these problems will be solved without the use of technological resources. Readily available electrical energy, data processing, electronic instrumentation and control, and communication are among the crucial resources needed.

A View of the Five-Year Major The purpose of the curriculum is to offer the student an education that has the breadth and depth necessary for professional practice. Breadth is needed to give the student an awareness of all that electrical engineering encompasses and to provide the necessary background for independent study, a major criterion for professional success. Individual career objectives and initial professional achievement can result, in part, from learning a subject area in some depth. To achieve the balance between depth and breadth, the curriculum is divided into the *core program* and *elective courses*.

The core program includes those courses with content applicable to all specialties in electrical engineering and offers students a basic background for future learning. Subject areas covered in the core program include:

1. Circuits and systems
2. Electronic devices and circuits
3. Digital computer design
4. Electromagnetic theory
5. Electromechanical dynamics (energy conversion)
6. Electrical measurements (laboratories)

The elective courses are designed to permit students to develop their own interests. Many students use this part of the program to learn a particular subject in depth and to better prepare for graduate studies. A broad range of courses is offered, including Digital Computer Techniques, Numerical Methods, Communication Systems, Control Systems, Advanced Electronics, Solid-state Devices, Power Systems, Wave Propagation and Distributed Circuits, Network Theory, and Mathematical Techniques in Electrical Engineering.

In addition, students who wish to conduct individual projects or learn about a subject area not offered in an elective course may enroll in the senior project course and work with an interested faculty adviser on a one-to-one basis.

Electrical engineering graduates of Northeastern have attended and done well at all of the prestigious graduate schools. Those who have entered industry find they compare favorably with graduates of other institutions and many have risen to positions of leadership in their professions.

Five-Year B.S.-M.S. Program

Students with high QPAs may elect the five-year B.S.-M.S. program. By taking some course overloads and forgoing one senior co-op term, a student may complete requirements for both the B.S.E.E. and M.S.E.E. degrees in five years.

Option in Power Systems Engineering

James M. Feldman, Ph.D., *Director*

The Power Systems Engineering Program in Electrical Engineering is a special option for those who wish to specialize in energy resources. This program is conducted in cooperation with the electric power companies in New England and other eastern states. The Master's degree can be obtained in six years of cooperative education or through the five-year B.S.-M.S. program described above. For further information about this program, students are advised to contact Dean Philip R. McCabe, Admissions, 150 Richards Hall.

Option in Computer Engineering

Martin E. Kaliski, Ph.D., *Director*

The option in Computer Engineering is provided for those who wish to specialize in the design of digital computers and their integration within larger systems for communications, resource management, and automatic control.

In the design of a digital processing system, hardware and software must be considered as an integrated entity—software cannot be separated from hardware considerations. Thus, the computer engineer must be both a capable programmer and a capable hardware designer. The collective demands of computer engineering plus traditional electrical engineering encompass more knowledge than can be included in a single, highly structured degree program. The solution at Northeastern, as at many other schools, was to adopt a new undergraduate option within Electrical Engineering. The objective of this option is to provide the student with a basic and comprehensive knowledge of the principles that underlie the organization, design, and applications of digital processing systems. It encompasses both the hardware and software design aspects of the system and offers students the opportunity to acquire an understanding of the important relationships and “trade-offs” between the hardware and software components of a digital system. This understanding is necessary in order to create computer systems that satisfy the users' needs at prices they can afford.

The Computer Engineering option follows curriculum recommendations in the report “An Undergraduate Computer Engineering Option for Electrical Engineering” by the Cosine Committee of the Commission on Education, National Academy of Engineering, Washington, D.C. 20418 (January, 1970). An important feature of this option is that it leads to a Bachelor of Science degree with specification—a degree in Electrical Engineering accredited nationally by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET).

Laboratories

The seven laboratory courses included in the program are an integral part of the educational process. Their purpose is both to supplement concepts developed in core courses and to introduce the student to design and experimental techniques.

To provide this facet of the educational experience, the Department has laboratory equipment in excess of \$1.5 million. In addition to standard professional laboratory equipment, several specialized laboratory facilities are maintained. These include several small digital computers such as a PDP-11, LSI-11, a number of CRT terminals, and a variety of microprocessors. Programming courses and research programs also use the large computer system at Northeastern's Computation Center.

The freshman-year program of studies in the College of Engineering is the same for all majors in the College. See page 141.

Basic Course Requirements

I. General Requirements

Course	Q.H.	Course	Q.H.
Calculus*	12	Calculus†	8
Physics*	12	Physics Lab†	2
General Chemistry*	8	L.A. Electives (2)†	8
English*	8	Math Analysis	8
Basic Engineering*	8	Social Science/ Humanities Electives	20
Physics†	4		

II. Professional Requirements

Course	Q.H.	Course	Q.H.
Circuits and Systems I & II†	8	Electronics A & B	8
Circuits and Systems III & IV	8	Field Theory I & II	8
Discrete Systems	4	Material Science	4
Thermodynamics	4	Design and Organization of Digital Computers	4
Mechanics	4	Electronics C	4
Electrical Engineering Lab.	8	Electromechanical Dynamics	4
		Technical Electives (4)	16

*Usually taken in the freshman year.

†Usually taken in the sophomore year.

The Electrical and Computer Engineering Department offers a wide variety of technical electives. These enable students to coordinate elective choices to satisfy their personal objectives of breadth or depth. To aid in selection, the elective courses are grouped by discipline.

Technical Electives**Electronic Circuits and Systems**

Selected Topics in Electronics
 Theory & Tech. of Semicond.
 Devices I
 Theory & Tech. of Semicond.
 Devices II
 Senior Project Labs
 Control Systems
 Communication Theory
 Math Techniques in E.E. I & II
 Numerical Methods & Computer
 Applications
 Digital Techniques

Electromagnetic Theory

Wave Transmission & Reception
 Advanced Topics in E & M
 Math Techniques in E.E. I & II
 Numerical Methods & Computer
 Applications
 Theory & Tech. of Semicond.
 Devices I & II
 Senior Project Labs

Computer Sciences

Numerical Methods & Computer
 Applications
 Digital Techniques
 Introduction to Digital Computers
 I & II
 Communication Theory
 Control Systems
 Math Techniques in E.E. I & II
 Selected Topics in Electronics
 Applied Discrete Analysis
 Machine & Assembly Language
 Programming
 Programming Systems
 Microcomputer-based Design
 Senior Project Labs

Systems Theory

Control Systems
 Communication Theory
 Math Techniques in E.E. I & II
 Numerical Methods & Computer
 Applications
 Digital Techniques
 Power Systems I & II
 Wave Transmission & Reception
 Senior Project Labs

Power Systems Option

Leading to

B.S. Degree—5 years**M.S. Degree—6 years****Basic Course Requirements****I. General Requirements**

Course	Q.H.	Course	Q.H.
Calculus*	12	Calculus†	8
Physics*	12	Physics Lab†	2
General Chemistry*	2	Electives	8
English*	8	Math Analysis	
Physics†	4	Social Science/ Humanities Electives (6)	24

II. Professional Requirements

Course	Q.H.	Course	Q.H.
Circuits and Systems I & II†	8	E.E. Power Lab.	4
Circuits and Systems III and IV	8	Math. Methods in E.E.	4
Thermodynamics	8	Nuclear Engineering	4
Electrical Engineering Lab	4	Technical Electives	4 or 8
Electronics A & B	8	Energy and Public Policy	4
Field Theory I & II	8	Linear Systems Anal.§	4
Transients in Power Systems	4	Anal. of Power Systems	4
Probability§	2	Seminars (2)§	4
Electromechanical Dyn.	4	Power Systems Planning§	4
Mechanics	4	Special Topics in Power§	2
Machines and Systems	8	Grad. Electives§	16
Electric Power Systems	8	Computers in Power Systems§	4
Professional Development	0	Electric Machine Theory§	2
		Electromagnetic Theory§	4

*Usually taken in the freshman year.

†Usually taken in the sophomore year.

§Graduate courses, not needed for the B.S. degree.

Computer Engineering
Option Leading to B.S.
Degree—5 Years

Basic Course Requirements

1. General Requirements

Same as general E.E. except for deletion of one 4-Q.H. required math analysis course and one 4-Q.H. arts and sciences elective.

II. Professional Requirements

Same as general E.E. except for the deletion of one 4-Q.H. required E.E. course (Electromechanical Dynamics) and the addition of the following required courses:

Course	Q.H.	Course	Q.H.
Introduction to Digital Computers II	4	Machine Language and Assembly Language Programming	4
Programming Systems	4		

Industrial Engineering and Information Systems Department

David R. Freeman, Ph.D., *Professor and Chairman*

Professors

Lewis H. Geyer, Ph.D.
Wilfred P. Rule, M.S.

Associate Professors

Franklyn K. Brown, M.S.
Richard I. Carter, M.S.
Thomas P. Cullinane, Ph.D.
Surendra M. Gupta, Ph.D.
Stewart V. Hoover, Ph.D.
Thomas E. Hulbert, M.S.
Robert S. Lang, M.S.
Ronald R. Perry, Ph.D.
Kenneth S. Woodard, M.S.

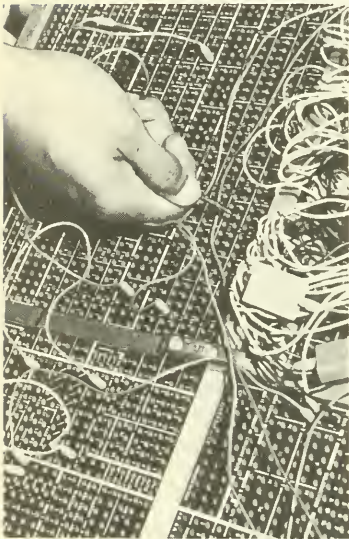
Assistant Professors

Geoffrey Berlin, Ph.D.
David S. Goldman, M.S.
Emanuel S. Melachrinoudis,
Ph.D.
Gerald Voland, M.S.

Instructors

James H. Bartlett, M.S.
Lawrence A. Bookman, M.S.
Pamela Halpern, M.S.
Joseph Missaghi, M.S.
Rena Tobias, M.S.

Professional Preparation



Aims Industrial engineers assist management in making decisions involving the utilization of individuals, materials, equipment, and energy to achieve the goals of an organization. Management needs factual information that defines the consequences of alternative decisions. The industrial engineer collects this information and evaluates alternatives to make the decision that best achieves a particular organizational goal. The scope of decisions may involve the entire organization or some portion of it associated with a given product or service.

Traditionally, industrial engineers have been most widely employed in manufacturing organizations, but increasingly they are finding employment in service industries, such as airlines, banks, hospitals, and local and federal government agencies. Courses in the curriculum reflect the industrial engineer's interest in society's changing attitudes about computers, population growth, pollution, and the quality of life.

Another responsibility of the Department of Industrial Engineering and Information Systems is to provide a comprehensive view of engineering. Students are confronted with several problems similar to those they may encounter in professional careers. Methods of problem solving and graphic representation of solutions are emphasized so that students have the opportunity to learn some of the ways engineers communicate, through drawings and sketches. The role of an engineer as a creative designer is described by relatively large case studies that show the step-by-step solution to specially chosen problems cutting across several engineering disciplines.

Another important aspect of the Department curriculum is the area of computers. The Department offers courses in FORTRAN, COBOL, PASCAL, Assembly language, and other topics to the entire University community. Each of these courses is heavily involved in applications to demonstrate the diverse ways in which the power of the computer may be applied to problems in areas such as engineering, social sciences, the humanities, and business.

Description of Major In performing problem analyses, the industrial engineer is concerned with complex, integrated man-machine systems. To treat the machine elements of the system, the industrial engineer requires knowledge of engineering fundamentals. Also necessary is some

background in the behavioral sciences to understand how the human elements of the system operate and how they relate to each other and the machines.

A View of the Five-Year Major The program is designed to include extensive course work in mathematics, physics, science, and the engineering sciences. The first two years provide the student the opportunity to build a strong foundation for use in later course offerings.

The required program affords students an opportunity to develop a strong base in probability, statistics, operations research, and computer systems. Courses in work design, personnel and organizational behavior, and engineering economy provide an exposure to the problems frequently encountered in industrial engineering. Elective offerings in the last few years provide an opportunity for students to familiarize themselves with other areas of industrial engineering, such as plant layout, quality control, simulation, management information systems, production and inventory control, and material-handling systems design.

The Computer Students are required to learn basic computer programming in their first year. In later years, they are asked to solve complicated problems by computer. The computer is of particular interest to the industrial engineer since many complicated problems, such as assembly-line balancing, mathematical modeling, and industrial simulations, require a computer solution.

Five-Year B.S.-M.S. Program

An accelerated program is available for honor students, allowing completion of the requirements for both B.S. and M.S. degrees in five years through course overloads starting in the third year and the elimination of the senior co-op term.

Laboratories

Integrated Laboratory The new Industrial Engineering Laboratory is an integrated lab used for a variety of different courses. Directly associated with the lab classroom are the computer console room, utilized in a variety of courses; the copying equipment for use in the plant layout courses; and the machine-tool lab for use in work design. Students work as individuals or in groups, depending upon the scope and complexity of the project. Extensive laboratory project work is also conducted in outside industrial plants and service organizations on real problems. Students can view actual operations on occasional plant visits.

Human Factors Laboratory Equipped primarily for experimentation in perception, the facility is used for demonstration and student projects.

Computer Laboratory A facility with two minicomputers provides an opportunity for students to gain experience in operating a small computer and utilizing it for application to actual engineering problems. The facility also houses terminals for communication with the University computer system.

Microprocessor and Manufacturing Systems Lab A laboratory with microprocessors for hands-on programming experience in the use of microprocessors in engineering applications. Students may also develop small experimental situations in the use of microprocessors and minicomputers in a manufacturing environment. Robotics experience and study are offered.

The freshman-year program of studies in the College of Engineering is the same for all majors in the College. See page 141.

Basic Course Requirements**I. General Requirements**

Course	Q.H.	Course	Q.H.
Calculus*	12	Physics†	4
Physics*	12	Physics Lab†	2
General Chemistry*	8	Economics I & II†	8
English*	8	Math Electives§	4
Basic Engineering*	8	Effective Speaking	3
Calculus†	8	Social Science/ Humanities Electives	20

II. Professional Requirements

Course	Q.H.	Course	Q.H.
Work Design*†	4	Personnel and Organizations	4
Engineering Science Elective†**	4	Engineering Economy and Statistical Decision Theory	4
Probability Analysis†	4	Engineering Science Electives (5)**	20
Statistics I & II	8	Technical Electives (4)††	16
Industrial Cost Control	4		
Operations Research	8		
Systems Analysis I & II	8		
Simulation	4		

*Usually taken in the freshman year.

†Usually taken in the sophomore year.

§Differential equations or suitable offering of Math Department, with consent of the adviser.

**Five Engineering Science courses are required. They must include:

Principles of Computation and Programming I
Mechanics
Electrical Engineering I

The remaining courses may be selected from:

Principles of Computation and Programming II
Electrical Engineering II
Mechanics II
Flow of Fluids
Thermodynamics I
Materials Science
Microprocessor Programming

††Four Technical Electives are required. Two must be Industrial Engineering electives:

Production Planning
Facilities Design
Quality Control
Management Information Systems
Human Factors
Industrial Relations
Human Considerations in Design
Data Base Management
Microprocessors
Material Handling Systems

Mechanical Engineering Department

Richard J. Murphy, Ph.D., *Professor and Acting Chairman*

Professors

John W. Cipolla, Jr., Ph.D.
 John F. Dunn, Sc.D.
 Arthur R. Foster, M.Eng.
 Welville B. Nowak, Ph.D.
*D. Smith Professor
 of Engineering*
 John N. Rossettos, Ph.D.
 Joseph J. Zelinski, Ph.D.

Associate Professors

George G. Adams, Ph.D.
 Ralph S. Blanchard, M.S.
 Alexander M. Gorlov, Ph.D.
 Bertram S. Long, M.E.
 Ernest E. Mills, M.S.
 Warren G. Nelson, Sc.D.
 Alvin J. Yorra, M.S.
 John Zotos, Met. Eng.

Assistant Professors

Gregory J. Kowalski, Ph.D.
 Mohamad Metghalchi, Ph.D.
 Robert L. Sullivan, M.S.
 Ahmet Talug, Ph.D.
 John L. Williams, Ph.D.
 Ibrahim Zeid, Ph.D.

Instructors

Louis J. Piscatelle, M.S.
 Mohammad Shishesaz, M.S.
 Kenneth A. Tepper, Ph.D.

Professional Preparation



Aims Mechanical Engineering is the branch of science broadly concerned with energy, including its transformation from one form to another, its transmission, and its utilization. Mechanical engineers conceive, plan, design, and direct the manufacture, distribution, and operation of a wide variety of devices, machines, and systems—including complex man-machine systems—for energy conversion, environmental control, materials processing, transportation, materials handling, and other purposes.

Mechanical engineers are engaged in all the engineering functions, including creative design, applied research, development, production, and management. The field of mechanical engineering is broad, providing an excellent professional base for career choice and interdisciplinary activities.

Description of Major The curriculum is intended to accommodate changing demands on the mechanical engineer by offering a firm foundation in the basic sciences before students direct their studies toward a chosen area of interest.

A View of the Five-Year Major In the first three years, students have the opportunity to learn the basic sciences (mathematics, physics, and chemistry), the engineering sciences (mechanics, thermodynamics, fluid mechanics, and material science), and the humanities. As upper-classmen, they may choose to concentrate their studies in the areas of thermofluid engineering, mechanics and design, or materials science and engineering.

Thermofluid engineering is concerned with the properties and characteristics of the working fluid of machines. For example, the ability of an aircraft to fly depends upon the manner in which air flows over its lifting surfaces. The energy to run a turbine is extracted from the steam or combustion gases that pass through it. The engineer must understand and

have a knowledge of the concepts of thermodynamics. The efficiency of a cooling tower depends upon the mechanisms by which fluids transfer heat to surfaces, so the engineer must have a firm grasp of the principles of heat transfer.

Mechanics and design are based upon the fundamental scientific and mathematical tools utilized in the analysis of mechanical configurations as they evolve in the design of machines and power-producing devices. For example, the engineer in the area of mechanics and design may analyze and design structural components for power plants and deep-sea oceanographic vessels or develop new methods for evaluating filamentary composite structures. In the modern machine-tool industry, engineers may be concerned with computer control of machine tools; in the engine industry, they may analyze stresses in components such as turbine blades. To prepare for such challenges, upperclass students have the opportunity to expand their basic knowledge by selecting courses such as Intermediate Strength of Materials, Vibrations, Systems Analysis and Control, Engineering Analysis, Design Fundamentals, and Computer-Aided Design.

Materials science and engineering is concerned with relationships among the structure, composition, properties, and functions of materials and with control of the structure and composition to achieve desired properties. Only recently have engineers come to realize that an understanding of the principles of materials science enables them to design more creatively and with greater freedom than the traditional reference to handbooks. Examples of areas in which mechanical engineers find materials properties a part of the basic design function include: manufacturing techniques, structures (vehicles, buildings), energy conversion, electronic devices (including computers), packaging, and prosthetic devices. Advanced courses are available for those mechanical engineers who desire further knowledge in the materials field.

Five-Year B.S.-M.S. Program Honor students may take an accelerated program allowing completion of the requirements for both B.S. and M.S. degrees in five years through course overloads starting at the third year and the elimination of the senior co-op term.

Special information

Mechanical Engineering Laboratories The laboratories in Mechanical Engineering contain equipment ranging from an electron microscope and ultrasonic measuring devices to pumps and weirs. Students working on thermofluids projects may use a turbine, various types of engines, thermoelectric coolers and generators, and a supersonic wind tunnel, to name a few. A material science laboratory provides research microscopes, various furnaces, a fluid-to-fluid extrusion press, x-ray diffraction equipment, electron microscope, and other related equipment. For the mechanics and design areas, vibrations, experimental stress analysis, and materials testing facilities are provided. A continuous effort is made by the Department to update and replace laboratory equipment.

Computers A Computer Vision CAD/CAM system has recently been installed to allow students hands-on experience in this rapidly emerging technology.

The freshman-year program of studies in the College of Engineering is the same for all majors in the College. See page 141.



Basic Course Requirements

I. General Requirements

Course	Q.H.	Course	Q.H.
English*	8	Physics†	4
General Chemistry*	8	Physics Lab†	2
Basic Engineering*	8	Math. Analysis	8
Calculus*	12	Social Science/Humanities	
Physics*	12	Elective	4
Calculus†	8	Economics†	4

II. Professional Requirements

Course	Q.H.	Course	Q.H.
Mechanics I & II†	8	Measurement & Analysis	4
Thermodynamics I†	4	Fluid Mechanics	4
Thermodynamics II	4	Materials Science	5
Mechanics III & IV	8	Design	4
Heat Transfer	4		

Junior and Senior Years

There are twelve courses to be selected by juniors and seniors in addition to four arts and sciences electives. All elective courses are subject to departmental restrictions. Students should obtain the latest departmental booklet describing these restrictions and current course offerings.

*Usually taken in the freshman year.

†Usually taken in the sophomore year.

Biomedical Engineering Department

Samuel Fine, S.M., M.D., *Professor and Chairman*

Associate Professor

H. Frederick Bowman, Ph.D.

Professional Preparation

Aims Biomedical engineering is concerned with the scientific principles underlying the physical and biological sciences and their application to problems of biological and medical significance.

Biomedical engineers are engaged in both theoretical and experimental studies either as independent investigators or as members of a research or development group. They may characterize and determine the mechanism of action of natural and synthetic macromolecules, analyze the properties of blood, and/or investigate the structure and function of such organ systems as the nervous system, the respiratory system, the cardiovascular system, or the endocrine system. They may design, develop, market and apply transducers, cardiac pacemakers and defibrillators, heart-assist systems, artificial kidneys and limbs, or diagnostic and therapeutic X-ray equipment. They are important members of the hospital health team.

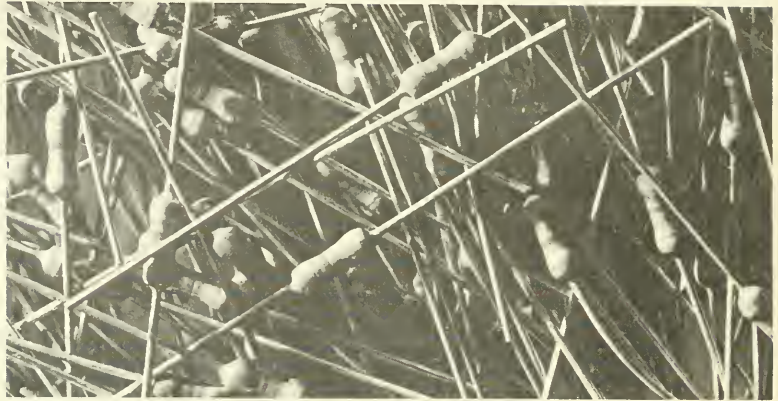
There is no special curriculum in Biomedical Engineering. Several of the engineering disciplines discussed in this catalog help provide the engineer with a background in the physical sciences. The purpose of the Biomedical Engineering Department is to assist the engineering student, from the freshman year through the senior year, in choosing courses in the biological sciences to complement those in the physical sciences and humanities taken in the standard engineering curriculum.

Courses may be chosen without prejudicing the students' obtaining degrees in their field of engineering specialization. In some cases, courses in the biological sciences can be taken as additional work during the student's career at the University. In other cases, courses in the biological sciences can be taken as electives in the standard engineering curriculum. The opportunity to take these courses is dependent on the student's interests, capabilities, and academic record. It is, of course, limited by possible schedule conflicts.

Students who wish to take an engineering program that includes biological sciences must contact the Biomedical Engineering Department on their arrival as freshmen at the University. This is important since biology is substituted in the first year for graphics.

Education in a program involving the physical and biological sciences offers a sound foundation for future work toward a doctorate in medicine or dentistry, a career in biomedical engineering, or a career as an engineer in a hospital or a government agency such as the Department of Health and Human Services, depending upon such factors as the state of the economy and the student's own industry and overall ability. Industrial organizations, particularly those in the health-care industry, may be seeking individuals with a strong background in engineering supplemented by a biological science education. Other career opportunities may include public health, the psychological sciences, and the marine sciences.

General Engineering Program



Advisory Committee for 1982–1983

Thomas E. Hulbert, M.S., *Industrial Engineering, Chairman*

Arvin Gabel, Sc.D., *Electrical Engineering*

Saul Namyet, B.S., *Civil Engineering*

Richard R. Stewart, Ph.D., *Chemical Engineering*

Alvin Yorra, M.S., *Mechanical Engineering*

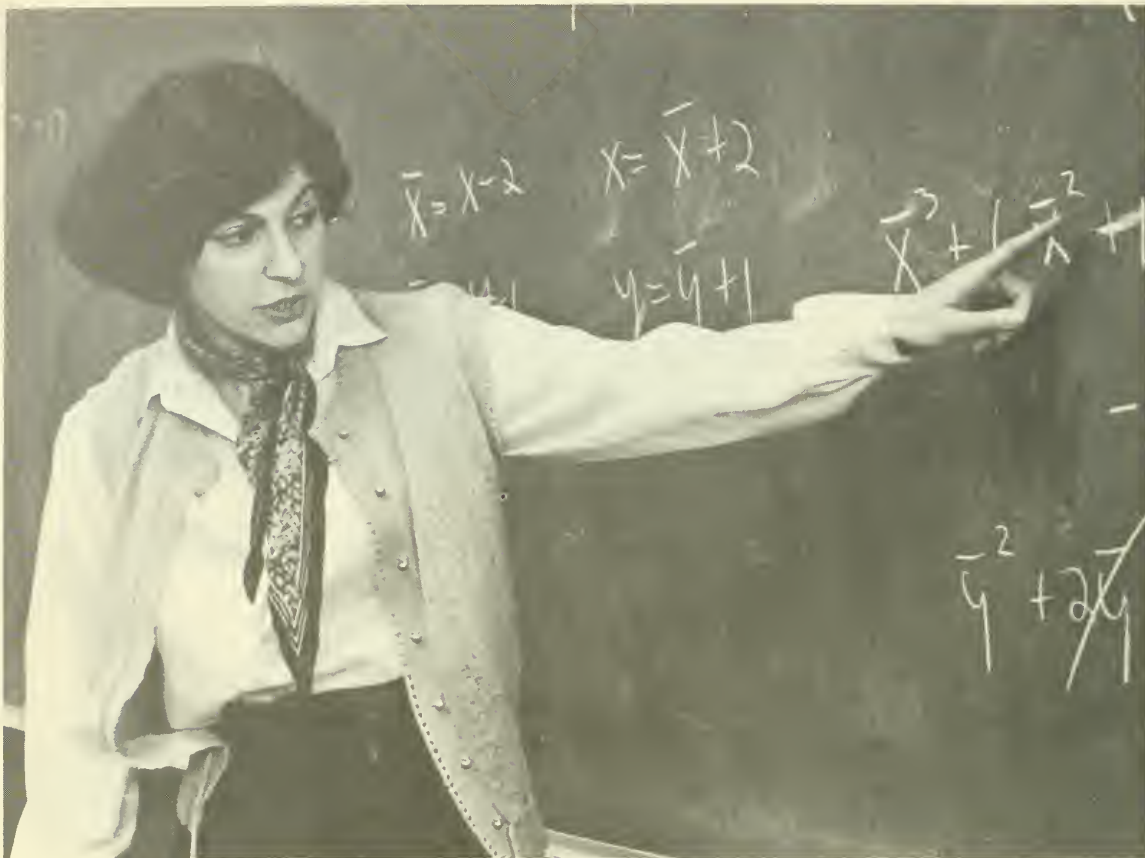
Professional Preparation

Aims Engineering and technology influence virtually all areas of endeavor and have a profound effect on the lifestyle and institutions of society. The impact is both cultural and scientific and is manifested by the awareness that solutions to society's problems are, in part, technological. The major purpose of the General Engineering program is to provide flexible, interdisciplinary educational opportunities based on fundamental engineering concepts. The interdisciplinary nature of the program allows the student to develop other areas of interest in which an engineering background is professionally useful.

Description of Major The program is designed for students whose interests are in engineering-related professions rather than in the traditional profession of engineering. It is expected that the work performed by graduates of this program will encompass the entire spectrum of professional activity, including such typical areas as computers, urban technology, social systems, and health care.

The General Engineering program is highly elective and gives students the opportunity to develop, in conjunction with their adviser, a program designed to meet their own career objectives. To achieve this goal, the student is exposed to the fundamental engineering areas through courses in electric circuits, systems, mechanics, thermodynamics, and materials. These courses are based on principles developed in early courses in mathematics and physics. In addition, because the computer is a basic tool in any technological environment, each student is required to learn the elements of computer programming. Students completing the adviser-approved program receive an unspecified B.S. degree from the College of Engineering.

Graduate education and continuing education are increasingly important in professional life. By appropriately planning their programs, students will be able to satisfy the course requirements necessary for admission to various graduate and professional schools, including law, medicine, public health, and social sciences, as well as engineering.



A View of the Five-Year Major Each student in the program is required to satisfy the following minimum requirements beyond the freshman year:

- 8 quarter hours in mathematics
- 6 quarter hours in physics (including laboratory)
- 4 quarter hours in circuit theory
- 4 quarter hours in materials
- 4 quarter hours in systems
- 4 quarter hours in thermodynamics
- 16 quarter hours in social sciences (consisting of at least two sequences of two courses each from the areas of sociology, economics, political science, and psychology)
- 8 quarter hours in the humanities, consisting of at least two courses from the areas of art, history, language and literature (not including grammar), music, philosophy, and drama (not including public speaking)

The remaining portion of the program is completely elective but must be designed to fit the student's career objectives. At least 24 quarter hours of course work must be taken in the professional departments of the College of Engineering (Chemical, Civil, Electrical and Computer, Industrial and Information Systems, and Mechanical Engineering).

Beyond the freshman year, students, in conjunction with a faculty adviser, plan their programs. Basically, the elective program permits each student to plan a distinctive and highly individual curriculum.

Although each student is enrolled in a "different program," the goals of each are the same: the breadth of an engineering-based liberal education in combination with the development of professional skills.

Lincoln College

Thomas E. Hulbert, M.S., P.E., *Director, Associate Dean of Engineering*
Jacob Wiren, M.S., P.E., *Assistant Director*
Rasma Galins, *Assistant to the Director*

Professor

Israel Katz, M.S., *Engineering Technology*

Associate Professors

Borah Kreimer, M.A., *Engineering Graphics*

Ernest E. Mills, M.S., P.E., *Electrical Engineering Technology*

Louis J. Nardone, M.S., P.E., *Electrical Engineering Technology*

Thomas E. Phalen, M.S., P.E., *Mechanical Engineering Technology*

Assistant Professor

Nonna Lehmkuhl, M.S., *Computer Technology*

Professional Preparation

Aims Lincoln College offers programs in engineering technology. Although these programs are concerned with the same general fields of engineering specialization, they concentrate on the applications of technology rather than its development.

Emphasis is placed on the rational processes involved in converting theories and ideas into practical techniques, procedures, and products. The engineering technologist works with the professional engineer, scientist, medical doctor, supervisor, and craftsman in converting scientific knowledge and craftsmanship into products and techniques. Fundamentals are related to current practice, providing a supportive "why" for the practical "how." At the same time, study of the humanities and social sciences gives students an opportunity to develop an awareness of the social, economic, and political influences that are part of the real world.

The structure of the Engineering Technology curriculum is based upon the dual need for relevant technical skills and a foundation for future growth. Engineering technology education can assist students to:

1. Understand the scientific principles that govern the current technology of the particular branch of engineering that they select
2. Develop competence in the application of technology to problem solving
3. Communicate effectively the important implications of technological advancements
4. Acquire the motivation for continued development of technical skills.

A View of the Five-Year Program Lincoln College offers five-year cooperative programs in Mechanical and Electrical Engineering Technology leading to the degree of Bachelor of Engineering Technology.

Since the first year of study is identical for all technology students, a firm choice of major may be delayed until the spring. At this time, the choice of cooperative work assignments makes a decision mandatory. Freshman courses act as a foundation for upperclass studies. About four-fifths of the upperclass program is devoted to scientific and technological study and about one-fifth to humanistic-social courses, with the aim of balancing technical proficiency with an appreciation for the non-

technical aspects of society and culture. Cooperative work assignments during the upperclass years are most valuable in helping students to integrate the important elements of both a technical and a liberal education.

Part-Time Program Offered During Evening Hours Lincoln College also offers seven-year, part-time curricula leading to the degree of Bachelor of Engineering Technology in the following areas:

- Civil Engineering Technology
- Mechanical Engineering Technology
- Mechanical-Structural Engineering Technology
- Electrical Engineering Technology
- Computer Technology

Classes are held in the evenings and on Saturday mornings. For further information on admission to these programs, contact the Lincoln College office at 408 Churchill Hall.

Graduation Requirements

Candidates for the Bachelor of Engineering Technology degree must complete all of the prescribed work of the curriculum in which they seek to qualify. A total of approximately 180 quarter hours is required for the degree. Students who undertake the cooperative education program must meet the requirements of the Department of Cooperative Education before they become eligible for their degrees.

Students transferring from another college or university are not eligible to receive the degree until they have completed at least one academic year at Northeastern immediately preceding their graduation.

Graduation with Honors

Baccalaureate candidates who have attained superior grades in their academic work will be graduated with honors. Upon special vote of the faculty, a limited number of this group may be graduated with high honors or with highest honors. Students must have been in attendance at the University at least six academic quarters and have earned a minimum of 72 quarter hours of credit before they may become eligible for honors at graduation.

Accreditation

All undergraduate baccalaureate day programs, as well as the evening part-time baccalaureate programs in Mechanical, Mechanical-Structural, Civil, and Electrical Engineering Technology, are accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET), formerly the Engineer's Council for Professional Development.

Facilities

The Northeastern electrical engineering laboratories are patterned after a composite of typical industrial research and development laboratories. Boasting a wide variety of modern testing and measuring equipment, the laboratories are an excellent adjunct to the classroom. Here, students may simulate or fabricate devices or systems that have been studied in their lecture courses.

From light machinery and power equipment to microwave precision systems, students plan and pursue their projects in the laboratory. Four LSI-11 Digital Equipment computers are available in the laboratories for direct programming or use in other laboratory experimentation. In addition, several varieties of microprocessors and associated equipment are used in student laboratories.

The Mechanical Engineering Department includes the following laboratories.

Materials and Metallurgy Laboratories—Equipped to treat the physical examination of materials and their structures. The equipment includes modern apparatus for vacuum melting technology, X-ray diffraction, and thermal expansion studies; two research metallographs; an electron microscope; and fluid-to-fluid extrusion press.

Fluid and Gas Dynamics Laboratory—Designed to study aerodynamic and hydrodynamic phenomena such as vortices, separation streamlines, and shock waves. Equipment includes an aerodynamalog, an axial flow fan, shock tube, subsonic wind tunnel, and supersonic wind tunnel.

Materials Testing and Stress Analysis Laboratories—Equipped to handle both the destructive and nondestructive testing of materials. This laboratory has a 300,000-pound Universal testing machine with an automatic electronic stress-strain recorder and high-temperature tensile test furnace. Stresses and strains may be determined experimentally by the use of strain-gage, photoelastic, photostress, and brittle-lacquer techniques.

Recent additions include vibration-testing units and fatigue-testing machine with a 2,000-pound capacity.

Heat Engineering Laboratories—Include a refrigeration unit, which may also operate as a heat pump; two solid injection diesel engines provided with a continuous oxygen analyzer, one equipped with a strain-gage torque meter; a CFR fuels-research engine equipped with a strain-gage pressure transducer; a 60-h.p. Rover gas turbine with automatic controls and Froude dynamometer; apparatus for study of steam-to-water heat transfer, comparison of film versus dropwise condensation, heat transfer to a boiling liquid, and thermocouple recovery factor; a thermoelectric generator to study the direct conversion of heat into electrical energy; a thermoelectric-refrigeration test facility for development of single and multistage thermoelectric coolers; and a Curtis steam turbine and condenser.

Automatic Control Laboratory—Includes a feedback control system and analog computers for simulating engineering problems, and fluid power testing units.

Academic Computer Services

The Northeastern University Computation Center is a support arm to the many computer-oriented curricula of the various departments throughout the University. The facility recently has been updated with the installation of a powerful Digital Equipment VAX series system with time-sharing capability. As the prime computation center necessary in meeting curriculum requirements, the Center is used by the students in both the Electrical Engineering Technology and Mechanical Engineering Technology programs.

Aviation Technology

Kenneth S. Woodard, M.S., *Adviser*

Lincoln College also offers a full-time program in Aeronautical Technology leading to an Associate's degree. This program is based at the Burlington Campus and flying may be done at Wiggins Airways in Norwood or other local pilot schools. The Pilot School is approved by the Federal Aviation Administration. Students having a strong interest in flying as an integral part of their careers should contact the program adviser at the Burlington Campus.

Women in Engineering Technology

Many women enter the technology field each year. Both government and industry provide positions of responsibility for women technologists. Any woman with technical or scientific interests should consider engineering technology as a career.

The freshman-year program of studies in Lincoln College is the same for all majors in the College.

Sample Freshman-Year Program of Studies in Engineering Technology

First Quarter

Algebra and Trigonometry I
Physics I
English/Writing
Engineering Design Graphics I
Principles of Computer
Programming

Third Quarter

Calculus I
Physics III
English/Literature
Physics Lab II

Second Quarter

Algebra and Trigonometry II
Physics II
English/Literature
Engineering Design Graphics II/
Electronic Graphics
Physics Lab I

In addition to the above courses, students may elect to take Basic ROTC.

Electrical Engineering Technology

Louis J. Nardone, M.S., *Coordinator for Electrical Engineering Technology*

Professional Preparation

Aims Because the Bachelor of Engineering Technology (BET) program has been designed to provide trained people for ready assimilation by the engineering field, its main thrust is not aimed at preparing the student for direct admission to the graduate schools of engineering.

However, for the student who achieves above-average grades, the BET program can be an avenue of admission to the College of Engineering via several options. Students who desire to explore this possibility should contact their freshman adviser or the Director of Lincoln College. In most other cases, graduates of the BET program will be eligible for graduate programs other than engineering, such as business, law, or education.

Description of Major Electrical engineering technology deals with the design and operation of equipment and systems related to power, communications, data processing, and electrical control. Its major functions include:

1. The generation, transmission, and distribution of electrical energy for light and power purposes
2. The development and production of equipment for telephone, radio, television, radar, and communication
3. The design and construction of data-processing systems and analog or digital computers
4. The application of electrical and electronic devices in the control of processes and manufacture.

A View of the Five-Year Major Since electrical engineering technology derives many of its fundamentals from developments in the pure sciences, the program of study begins with basic courses in mathematics and physics. In addition, the freshman year includes literature and engineering graphics to aid students in developing the skills with which to express themselves.

In the upperclass years, courses are divided into four related sequences: circuits and systems, including feedback control; microwave devices; energy conversion, emphasizing electromagnetic devices; and laboratory work associated with all of the foregoing. Current practice is stressed.

In the senior year, electives are offered to ensure that students acquire both depth and specialization.

The freshman-year program of studies in Lincoln College is similar for all majors in the College. See page 166.

Basic Course Requirements**I. General Requirements**

Course	Q.H.	Course	Q.H.
Algebra and Trigonometry I & II*	8	Principles of Computer Programming*	4
Calculus I*	4	Physics I, II, III*	12
Calculus A & B†	8	Physics IV†	4
English*	12	Physics Lab I & II*	2
Principles of Economics	4	Arts and Sciences Electives†	8
Engineering Design Graphics I*	4	Arts and Sciences Electives	12
Electronic Graphics	4	Technical Electives	16

II. Professional Requirements

Course	Q.H.	Course	Q.H.
Circuit Analysis I & II†	8	Digital Computers	4
Circuit Analysis III & IV	8	Distributed Systems	4
Physical Electronics†	4	Circuits Lab I†	2
Electronics I, II, III	12	Circuits Lab II	2
Control Engineering I & II	8	Electronics Lab	2
Engineering Analysis I	4	Advanced Electronics Lab I, II, III	6
Energy Conversion	4		
Electrical Measurements	4		

*Courses are taken in the freshman year.

†Courses are taken in the sophomore year.

Mechanical Engineering Technology

Ernest E. Mills, M.S., *Coordinator for Mechanical Engineering Technology*

Professional Preparation

Aims The objectives of the program are the same as those listed for the Electrical Engineering Technology program.

Description of Major Mechanical engineering technology deals with the use of machinery to harness power resources and perform useful work. In contrast to civil engineering, which deals primarily with static forces and structures, mechanical engineering is more concerned with the motion and kinetics of devices activated by hydraulic, electrical, mechanical, or thermodynamic forces. Major functions of the mechanical engineering technologist include:

1. Design and installation of all kinds of machinery, from pocket watches to the largest steel boring mills
2. Development and production of engines and transport equipment, as in automobiles, aircraft, ships, or railway cars
3. Construction and operation of furnaces and boilers, as well as heating and air-conditioning equipment, for the control of atmospheric and environmental conditions.

A View of the Five-Year Major Since machinery is the predominant concern of the mechanical engineer, the program of study is designed to offer considerable training in the principles underlying the design and operation of engines, power transmission devices, machine tools, and other machinery. This, of course, implies a thorough study of the physical laws concerning motion and transfer of energy. Applied mechanics, thermodynamics, and study of materials will occupy prominent places in the program.

These studies help provide the student with a broad foundation in those fundamental subjects essential to the understanding of current practice. In the junior and senior years, students have considerable elective choice and opportunity for specialization.

The freshman-year program of studies in Lincoln College is the same for all majors in the College. See page 166.

Basic Course Requirements

I. General Requirements

Course	Q.H.	Course	Q.H.
Algebra and Trigonometry I & II*	8	Physics Lab I & II*	2
Calculus I*	4	Engineering Design	
Calculus A, B†	8	Graphics I, II	8
English*	12	Principles of Computer Programming*	4
Principles of Economics	4	Arts and Sciences	
Physics I, II, III*	12	Electives	20
		Technical Electives	24

II. Professional Requirements

Course	Q.H.	Course	Q.H.
Mechanics A, B†	8	Mechanical Design	6
Mechanics C	4	Thermodynamics A, B, C, D	14
Stress Analysis A†	4	Fluid Mechanics A & B	6
Stress Analysis B	4	Mechanical Laboratory	6
Materials†	4	Heat Laboratory	4
Engineering Design	4	Project Laboratory	4
Electricity and Electronics	4		

*Usually taken in the freshman year.

†Usually taken in the sophomore year.

College of Nursing

Juanita O. Long, R.N., M.S.N., Ed.D., *Dean*

Joan Grindley, R.N., M.S.N., Ed.D., *Associate Dean*

Adele I. Law, R.N., M.S.N., *Assistant Dean*

Angelo J. Logiudice, M.Ed., C.A.G.S., *Assistant to the Dean*

Associate Professors

Jane Aroian, R.N., M.S.N.

Olivia M. Breton, R.N., M.Ed.

Elaine Capozzoli, R.N., M.A.

Janet Carroll, R.N., M.S.

Ellen T. Daly, R.N., M.S.N.

Flora M. DeScenza, R.N., M.S.

M. Paula Fellows, R.N., M.S.

Jean P. Gilbert, R.N., M.S.

O. Barbara Goodfellow, R.N.,
M.S.N.

Mary C. Keaney, R.N., M.S.N.,
C.A.G.S.

Jane M. Lee, R.N., M.S.

M. Marcia Lynch, R.N., M.S.

Susan C. Marchessault, R.N.,
M.S.

Geraldine A. Medici, R.N., M.S.

Marilyn M. Smith, R.N., M.S.,
M.B.A.

Joyce E. Tingle, R.N., M.S.

Nancy Walden, R.N., M.S.N.

Mary E. Wilcox, R.N., M.S.

M. Delaine Williamson, R.D., M.S.

Assistant Professors

Sister Marie Bransfield, R.N.,
M.S.N.

Nancy N. Carr, R.N., M.S.

Sally J. Cloutterbuck, R.N.,
M.S.N.

Lael T. Cutler, R.D., M.P.H.

Barbara A. DiBenedetto, R.N.,
M.S.

Elaine Hurley, R.N., M.S.

Nancy E. Lyga, R.N., M.S.

Joan L. Mamelok, R.N., M.S.

D. Jeanne Otto, R.N., M.S.,
M.Ed.

Diane W. Porter, R.N., M.S.

Patricia S. Williams, R.N., M.S.

Eve Ellen Wise, R.N., M.S.

Karen A. Wolf, R.N., M.S.

Instructors

Helen Ahearn, R.N., M.S.N.

Jane Armstrong, R.N., M.S.N.

Jane E. Ashley, R.N., M.S.N.

Annette P. Gaines, R.N., M.S.

Paroohy G. Jacobsen, R.N.

Barbara A. Lagerbom, R.N., M.S.

Kelly Mayo, R.N., M.S.N.

Professional Preparation

Aims First in the nation to operate on a cooperative plan, the College of Nursing was established at Northeastern University in 1964.

The generic baccalaureate degree program is five years in length and leads to the degree of Bachelor of Science in Nursing. The program is designed to offer students the opportunity to prepare themselves for positions as beginning professional practitioners, giving nursing care in a variety of patient-care settings, and to obtain the foundation for graduate study.

Opportunities for Registered Nurses The College of Nursing accepts Registered Nurses who wish to complete requirements for the Bachelor of Science degree in Nursing as full-time day or part-time evening students.

The length of the program depends upon the individual's interest and ability to achieve advanced placement. Applicants whose knowledge of subject areas has been obtained through actual experience, previous educational preparation, or individual study are encouraged to apply for credit through the advanced placement process. This opportunity is available for most of the nursing and non-nursing courses. Tests prepared by Northeastern University faculty, National League for Nursing, and C.L.E.P. (College Level Examination Program) may be utilized.



A View of the Nursing Program In common with the other Basic Colleges at Northeastern, the College of Nursing operates on the cooperative plan. In addition to college instruction, each student has the opportunity to obtain practical experience as a paid employee of one of the cooperative health-care agencies. The work does not carry academic credit, but it must be satisfactorily completed. During periods of employment, students have the opportunity to increase nursing skills and gain significant experience in nursing settings, as well as earn money to help defray expenses.

The College of Nursing program offers general education courses concurrently with nursing courses to provide the educational foundation for the practice of nursing. Required courses for the Nursing major are planned in sequential order and draw on content from the physical, biological, and social sciences and from the humanities.

Freshmen remain on campus for three consecutive quarters of academic study, while students in succeeding years alternate periods of study at Northeastern with periods of cooperative work experience in participating health agencies.

Cooperative work placements are arranged by a nursing coordinator in accordance with agreements made by the University and a number of hospitals in the Greater Boston area and surrounding communities. Cooperative work experience is a requirement for the degree except for the experienced registered nurse students. Student preferences as to assignment will be given consideration in conjunction with other factors.

Under the guidance of the College of Nursing faculty, clinical experience in the care of patients is introduced during the second year of the program. Approximately thirty outstanding hospitals and health-related agencies are utilized to provide facilities for clinical laboratories.

Graduation Requirements

Degrees A Bachelor of Science in Nursing degree is awarded upon completion of the program. All candidates must successfully complete all the prescribed courses, and generic students must complete the prescribed periods of cooperative work. One hundred and seventy-nine quarter hours are required for the Bachelor of Science degree. An overall minimum scholastic average of C in both nursing and general studies is required for graduation.

Graduation with Honors

Candidates for the Baccalaureate degree who have attained superior grades in their academic work will be graduated with honors (3.0 GPA). Upon special vote of the faculty, a limited number of this group are graduated with high honors (3.5 GPA) or highest honors (3.750 GPA). Students must attend the University at least six quarters to become eligible for honors at graduation.

Accreditation

The program of the College of Nursing is fully accredited by the National League for Nursing and approved by the Board of Registration in Nursing of the Commonwealth of Massachusetts.

Licensure

The program of the College of Nursing is designed to prepare graduates to qualify to take the professional examination established by the Board of Registration in Nursing. Graduates are expected to take this examination for licensure as a registered nurse when the examination is first offered after graduation.

Acceleration Policies

Enrolled students who wish to accelerate must satisfy the following criteria:

Students should have a minimum of sixty quarter-hour credits accepted by Northeastern University's College of Nursing *before entrance* into the nursing program.

Students must have achieved a cumulative average of 3.0 or better in the following nursing courses: 80.217, 80.218, 80.219, 80.220, and 80.221.

Life experience in health-related fields will be examined to ascertain whether these meet the established objectives of cooperative nursing education. A student may petition to be exempt from a maximum of three cooperative experiences.

Rotation into a clinical nursing course is contingent upon available openings in the course. Students accelerating in nursing courses will be required to meet the existing promotional policies. All students receiving a degree from Northeastern must be in residence for one year.

Students will be allowed to transfer credits earned in courses at other institutions if a grade of C or better has been obtained and if the descriptions of the courses taken are comparable to courses required at Northeastern University.

Special Requirements

Students in the College of Nursing are required to wear the school uniform in clinical laboratory areas during academic quarters. A modification of the uniform is worn during cooperative work periods.

All students must carry malpractice insurance. Arrangements for this insurance are made by the University.

Health Clearance Every student must have a complete physical examination and rubella titre prior to admission to the College of Nursing.

Sample Freshman-Year Program of Studies in the Nursing Program

First Quarter

Biology
Western Civilization
English
Nursing

Third Quarter

General Chemistry
Anatomy
Western Civilization
Human Nutrition

Second Quarter

General Chemistry
Biology
English
Nursing

NOTE: Current requirements now being revised. Information concerning new requirements may be obtained from the Office of the College of Nursing, 102 Robinson Hall.



Basic Course Requirements: Baccalaureate Degree

I. General Requirements

Course	Q.H.	Course	Q.H.
Biology*	8	Fundamentals of Psychology I & II†	8
Western Civilization*	8	Social Anthropology†	4
English*	8	Principles of Sociology**	4
General Chemistry*	10	Social Psychology**	4
Anatomy*	4	Electives (6)	24
Microbiology†	4	(includes 8 Q.H. of Humanities)	
Physiology†	8		

II. Professional Requirements

Course	Q.H.	Course	Q.H.
Nursing*	8	Maternal-Child Nursing	9
Human Nutrition*	4	Psychiatric-Mental Health Nursing**	7
Nursing†	12	Community Health Nursing	9
Growth and Development I & II**	8	Contemporary Nursing	9
Pharmacology**	3		
Nursing**	7		
Medical-Surgical Nursing	9		

*These courses are usually taken in the freshman year.

†These courses are usually taken in the sophomore year.

**These courses are usually taken in the third year.

College of Pharmacy and Allied Health Professions

Gerald E. Schumacher, Ph.D., *Dean*

Judith T. Barr, M.Ed., *Associate Dean*

John L. Neumeyer, Ph.D., *Director, Graduate School of Pharmacy and Allied Health Professions*

Joseph F. Palumbo, M.S., *Assistant to the Dean for Student Affairs*

Steven H. Tierney, Ed.D., *Assistant to the Dean for Student Affairs*

Kathleen T. Foley, A.S., *Assistant to the Dean*

Theresa Perry, Ed.D., *Coordinator, Health Careers Opportunity Program*

Professional Preparation

Aims Northeastern University recognizes the increased demand for well-educated pharmacists and allied health professionals. The College of Pharmacy and Allied Health Professions is pledged to meet this need through a unique combination: the cooperative plan of education and a highly innovative academic program designed to offer students the opportunity to prepare themselves to become effective professional practitioners, to enter graduate schools, and to obtain employment in the many areas responsible for the delivery of health care.

A View of the Five-Year Program Fundamental to the College's approach to health-care education are:

1. A curriculum of highly relevant and closely integrated courses in the physical, biological, behavioral, and administrative sciences comprising the basis of modern professional practice;
2. A meaningful involvement in the clinical aspects of patient care via affiliations with teaching hospitals and related institutions;
3. A cooperative work program, including an externship-internship period, and a clinical component offering students the opportunity to acquire the skills and actual experience integral to the total program;
4. A commitment to the search for and advancement of new and progressive concepts, ideas, and philosophies of education and professional practice.

Facilities

The College occupies the Mugar Life Sciences Building on the main campus of the University. Completed in 1963, this multimillion-dollar facility offers proximity to all the academic and extracurricular activities of the University.

The building and the Amelia Peabody Health Professions Center addition, with its well-equipped laboratories and classrooms for both undergraduate and graduate programs, are designed to anticipate the physical needs of a growing and progressive College. In addition to faculty and administrative offices, a Drug Information and Resource Center, a data-processing area, and the graduate school, there are laboratories for radioisotopes, clinical chemistry, medicinal chemistry, drug analysis, prescription pharmacy, hematology, immunology, pharmacology, respiratory therapy, medical record science, and clinical microbiology. Animal rooms and audiovisual capabilities for all programs are also featured in this five-story structure. Research facilities are available for upperclass students who participate in original research projects.

Transfers with Advanced Standing

The College of Pharmacy and Allied Health Professions may accept qualified transfer students who have successfully completed one or more years of preprofessional course work in an accredited college or university.

Degrees Granted

The degrees of Bachelor of Science, Bachelor of Science in Pharmacy, Bachelor of Science in Respiratory Therapy, Bachelor of Science in Toxicology, Associate in Science, and Associate in Science in Dental Hygiene are awarded to qualified candidates.

Accreditation

Each of the programs offered by the College is accredited by the appropriate professional group. The College holds membership in both the American Association of Colleges of Pharmacy and the American Society of Allied Health Professions.

Health-Care Curriculum Open Option

If you are interested in pursuing a career in the health-care professions but are undecided as to which profession is right for you, then explore the Open Option offered by Northeastern's College of Pharmacy and Allied Health Professions.

A Valuable Foundation The Open Option program offers freshmen a core of courses designed to provide a basic scientific background required for each of the professional programs in the College of Pharmacy and Allied Health Professions. You also are introduced to the basic principles of health-care delivery, health-care agencies and services, and attitudes, behavioral aspects, and policies that may influence health-care systems.

The Advantages The Open Option is especially valuable to students who need assistance in determining an area of interest within the health-care field. By examining various professions, and thus gaining an overview of the discipline, you can refine your health-care career goals. You may also familiarize yourself with what is expected of you in various health-care professions. Subsequent selection of a professional program may proceed more smoothly, an advantage that may help you gain more confidence and certainty in pursuing your degree. Even though in the Open Option you consider various health professions, you still complete some prerequisite courses required of all the professional programs and so do not lose valuable time prior to selecting a major.

The Open Option Plan

In the Open Option Plan, you may complete the core courses in the first-year curriculum without selecting a profession in which to major and without loss of valuable time. Upon satisfactory completion of the first year of courses, you select a professional area in which to major. Professions in the college include: pharmacy, health record administration, medical laboratory science, respiratory therapy, and toxicology.

The courses offered in the first-year Open Option include:

- Functions and Basic Calculus
- General Chemistry I and II
- General Biology
- Animal Biology
- Freshman Writing
- Introduction to Literature
- Professional Dynamics in the Health-Care Delivery System

Satisfactory completion of the eight courses in the Open Option core curriculum, as well as other courses completed during the freshman year, is necessary for admission to one of the professional programs of the college.

The Open Option Plan does not apply to the Dental Hygiene and Physician Assistant programs.

Dental Hygiene

Professional Preparation

Aims The Forsyth School for Dental Hygienists conducts a program of dental hygiene education in cooperation with Northeastern University. Students in this two-year program attend classes at both the Forsyth Dental Center and Northeastern. The dental hygienist is licensed to render preventive services to a patient under the supervision of a dentist, including administering dental prophylactic treatment, preparing dental radiographs, and teaching prescribed methods of maintaining dental health.

A View of the Program The first year includes courses in anatomy and physiology, chemistry, microbiology, history, nutrition, dental materials, radiology, periodontology, dental hygiene, and clinical dental hygiene instruction. In the second year, students take general courses, such as English, sociology, and psychology, and professional courses in pathology, public health, pharmacology, dental hygiene, and head and neck anatomy; they also continue to receive clinical dental hygiene instruction.

Degrees Students satisfactorily completing the program will receive the Certificate in Dental Hygiene from Forsyth and may elect to receive the Associate in Science degree in Dental Hygiene from Northeastern University. Graduates are required to fulfill the Dental Hygiene licensure requirements in the state in which they intend to practice.

Accreditation

This program is accredited by the Commission on Accreditation of Dental and Dental Auxiliary Education Programs of the American Dental Association.

Admissions

Students are admitted directly to the Forsyth School for Dental Hygienists and should contact Forsyth for catalogs and applications by writing to 140 The Fenway, Boston, Massachusetts 02115.

Sample Freshman-Year Program of Studies in Dental Hygiene**First Quarter**

Human Anatomy and Physiology
 Chemistry
 Dental Anatomy
 Radiology
 Dental Hygiene
 Clinical Dental Hygiene

Third Quarter

Microbiology
 Dental Materials
 Periodontology II
 Nutrition
 Dental Hygiene
 Clinical Dental Hygiene

Second Quarter

Human Anatomy and Physiology
 Chemistry
 Histology
 Periodontology I
 Dental Hygiene
 Clinical Dental Hygiene

Basic Course Requirements**I. General Requirements**

Course	Q.H.	Course	Q.H.
English Composition and English Literature†	8	Foundations of Psychology I†	4
Chemistry*	8	Sociology†	4
Microbiology*	4	Human Anatomy and Physiology*	10

II. Professional Requirements

Course	Q.H.	Course	Q.H.
Dental Anatomy*	2	Pathology†	3
Radiology*	2	Periodontology*	4
Dental Hygiene**	12	Public Health†	2
Clinical Dental Hygiene**	23	Pharmacology†	2
Nutrition*	2	Head and Neck Anatomy†	2
Histology*	2	Dental Materials*	2
		Independent Study†	2

*These courses are usually taken in the first year.

†These courses are usually taken in the second year.

**These courses are usually taken in both the first and second years.

Health Record Administration

Judith Weilerstein, M.P.H., *Associate Professor and Director*

Assistant Professor

Sheryl A. Rimer, M.P.H.

Professional Preparation

Aims A health record administrator may organize, operate, and manage medical record services. Northeastern's program offers students the opportunity to develop the capability to design health information and retrieval systems; to plan, organize, and direct medical record services; to develop, analyze, and evaluate medical records and indexes; to work with medical and administrative staffs in developing methods for evaluation of patient care; and to participate in research projects utilizing health-care information.

A View of the Five-Year Major In the first two years, the student will concentrate on liberal arts and sciences, including the required human anatomy and physiology courses with an overview of microbiology. Courses in health-care science are offered to help the student prepare for a role in health administration and health-care delivery.

The program offers the opportunity for preparation in administration, in departmental and hospital management and organization, and in electronic data processing. The professional courses in medical record science, medical terminology, and hospital law are complemented by directed applied study in medical record science at an affiliated health facility.

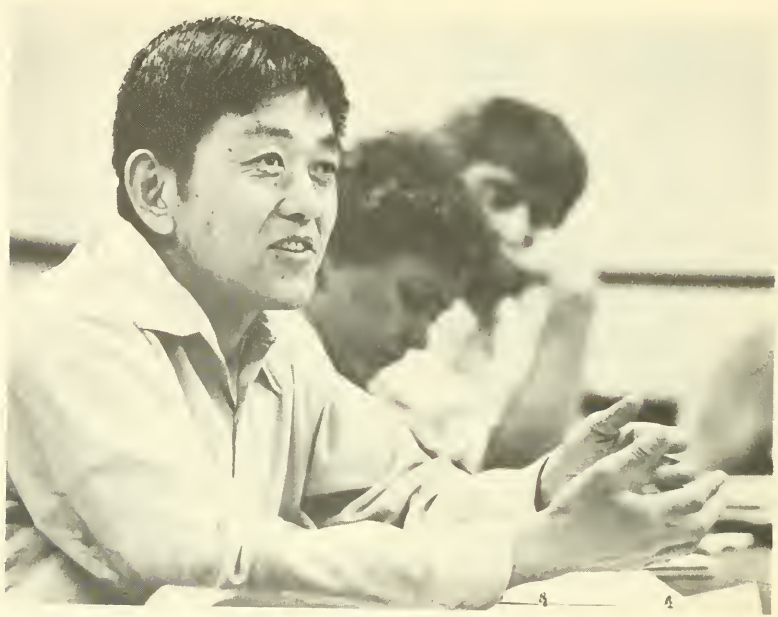
Degree The Health Record Administration program is offered on the cooperative plan. Successful completion of the prescribed curriculum, including directed study at an affiliated health center, will permit the award of a Bachelor of Science degree. Usually, graduates are eligible to take the registration examination given by the American Medical Record Association.

Accreditation

This program is approved by the Committee on Allied Health Education and Accreditation in cooperation with the American Medical Record Association.

Special Information

Students interested in this profession should arrange for an interview with the program director.



Sample Freshman-Year Program of Studies in Health Record Administration

First Quarter

English Composition
Biology
Math
Psychology
Orientation to Health Records I

Third Quarter

Psychology
Modern Language or
Political Science
Microbiology
English Literature

Second Quarter

Biology
Math
Modern Language or
Political Science
Professional Dynamics in the
Health-Care Delivery System

In addition to the above courses, students may choose to take ROTC.

Basic Course Requirements

I. General Requirements

Course	Q.H.	Course	Q.H.
English Composition and English Literature*	8	Organizational Behavior	4
Mathematics*	8	Introduction to Computer Science	4
Communications	4	Psychology*	8
Biology (General and Animal)*	8	Sociology†	4
Anatomy and Physiology†	10	Modern Language or Social Sciences*	8
Microbiology†	3	General Electives	16
Statistics	4		
Economics or Western Civilization	8		



II. Professional Requirements

Course	Q.H.	Course	Q.H.
Orientation to Health Records	2	Seminar in Medical Records	2
Health Records Science I-IV	16	Health Science Education Applied Study	2
Medical Terminology	4	Hospital Organization and Management	9
Foundations of Medical Science	6	Application of Medical Computers	4
Hospital Law	2	Quality Assurance	4
Organization and Management Medical Record Dept.	12	Independent Study	4
Applied Health Statistics	4	Special Topics**	4
Clinical Seminar	2	Health Record Professional	2
		Professional Dynamics in the Health-Care Delivery System*	4

*These courses are usually taken in the freshman year.

†These courses are usually taken in the sophomore year.

**Assigned per Program Director.

Medical Laboratory Science Medical Technology

Gerald L. Davis, Ph.D., *Associate Professor and Director*

Professor

James J. Gozzo, Ph.D.

Associate Professors

Judith T. Barr, M.Ed.

Britta L. Karlsson, M.S.

Assistant Professors

Jessie L. Hansen, M.S.

John Klaas II, Ph.D.

Elizabeth G. Szymczak, M.S.

Professional Preparation

Aims Medical technology involves the application of principles of natural, physical, and biological sciences to the performance of laboratory determinations used in the diagnosis and treatment of disease and the maintenance of health. It is projected that the demand for properly educated and certified medical technologists will increase as a result of greater emphasis on the quantity and quality of health-care delivery. With educational opportunities available in hematology, immunohematology, clinical chemistry, and clinical microbiology, students have the opportunity to prepare themselves for positions not only in a hospital laboratory but also in research, industrial, and governmental institutions.

For qualified graduates, additional opportunities may be found in laboratory administration, education, and graduate programs.

A View of the Five-Year Major Students enter the College as Health Professions majors in the Medical Laboratory Science program. The College offers a five-year, modified cooperative course of study leading to the degree of Bachelor of Science. Upon satisfactory completion of the professional segment and baccalaureate degree, the student should be eligible to take a written national certification examination in medical technology. Some states may require additional licensure examinations.

During the junior and senior years, qualified students are assigned to the hospital components of the medical technology program. To qualify for entrance into the hospital component of the program, students must have an acceptable grade point average; have completed successfully all University course requirements, including those in biology, chemistry, mathematics, and medical laboratory science; and have met other criteria established by the Clinical Studies Admission Committee. The professional courses in hematology, pathogenic microbiology, serology, mycology, parasitology, clinical chemistry, instrumentation, and blood banking are included in both the University and the hospital components of the program.

Students register at the University for twelve quarters. This twelve-quarter curriculum includes the academic program plus all current clinical and professional requirements.

Degree The degree granted will be the Bachelor of Science.

Accreditation

This program is accredited by the Committee on Allied Health Education and Accreditation of the American Medical Association.

Option

After completing the first two years of academic study and the basic professional courses, qualified students may take the appropriate practicum leading to eligibility to take a national certification examination for medical laboratory technicians and may earn the Associate's degree at the University.

Sample Freshman-Year Program in Medical Laboratory Science

First Quarter

Math or Calculus
General Chemistry
General Biology
English Composition
Orientation to Medical
Laboratory Science

Third Quarter

Elective
English Literature
Elective
Basic Medical
Laboratory Science
Analytical Chemistry

Second Quarter

Math or Calculus
General Chemistry
Animal Biology
Professional Dynamics in
the Health-Care
Delivery System

Basic Course Requirements**I. General Requirements**

Course	Q.H.	Course	Q.H.
English and English Literature*	8	Genetics and Developmental Biology	4
Biology—General and Animal*	8	Physics	8
Math or Calculus*	8	Microbiology	3
General Chemistry*	10	Humanities Electives	12
Organic Chemistry†	10	Social Science Elective	8
Analytical Chemistry*	4	General Electives	12
Physiology†	8	Professional Elective	4
Cell Biology	4		

II. Professional Requirements

Course	Q.H.	Course	Q.H.
Orientation to Medical Laboratory Science*	1	Clinical Chemistry II, III, IV	6
Basic Medical Laboratory Science*	3	Clinical Microbiology II, III, IV	6
Basic M.L.S. Hematology I†	3	Applied Study (at hospital)	15
Basic M.L.S. Hematology II†	3	Communications in the Health Sciences	4
Basic M.L.S. Clinical Immunology†	3	Laboratory Management	2
Basic M.L.S. Immunohematology†	3	Health Science Education	2
Basic M.L.S. Chemistry and Instrumentation†	5	Instrumentation I	1
Basic M.L.S. Clinical Microbiology†	6	Parasitology	2
Basic M.L.S. Electronics	1	Mycology	2
Hematology III	3	Senior Seminar	2
Immunohematology	2	Special Topics	2
Hematology IV	2	Professional Dynamics in the Health-Care Delivery System*	4

*These courses are usually taken in the freshman year.

†These courses are usually taken in the sophomore year.

Pharmacy

Richard C. Deth, Ph.D., *Associate Professor and Director*

Medicinal Chemistry Section

Robert N. Hanson, Ph.D.,
*Associate Professor and
Section Leader*

Professors

Roger W. Giese, Ph.D.
John L. Neumeyer, Ph.D.
Robert F. Raffauf, Ph.D.

Pharmaceutics Section

Gerald E. Schumacher, Ph.D.

Assistant Professor

Mehdi Boroujerdi, Ph.D.

Pharmacology Section

Professors

O. James Inashima, Ph.D.

Elliot Spector, Ph.D.

Assistant Professor

Norman R. Boisse, Ph.D.

Pharmacy Practice Section

Larry N. Swanson, Pharm.D.,
*Associate Professor and
Section Leader*

Professor

Arnold S. Goldstein, L.L.M.

Assistant Professors

Barbara Ameer, Pharm.D.
David Barnard, Ph.D.
Robert J. Cersosimo, Pharm.D.
Donna L. Goolkasian, Pharm.D.
Samuel J. Matthews, Pharm.D.
Alan H. Mutnick, Pharm.D.
Fred M. Schneiweiss, Pharm.D.

Professional Preparation

Aims The need for well-qualified pharmacists is likely to continue in direct response to the greater emphasis on health care and, in particular, to the newer and more diversified utilization of those now in practice in this country. The majority of pharmacists are associated with community practice, and some of these are self-employed. Hospital pharmacy and institutional practice have attracted a large number of practitioners and represent the fastest-growing areas of the profession. The increased use of the pharmacist as a drug consultant to the medical and nursing staffs of these institutions has broadened the scope of professional opportunity and given practitioners even greater involvement as part of the health team.

Pharmacy also offers careers in research, manufacturing, government, law enforcement, and education. A considerable number of our graduates have entered leading graduate and professional schools. Another significant trend is found in the increasing number of women entering the profession. Approximately 40 percent of the entering class is now composed of women.

A View of the Five-Year Major The College offers a five-year curriculum that leads to the degree of Bachelor of Science in Pharmacy. The curriculum offers instruction in each of three natural divisions: (1) arts and sciences courses in general education (the humanities and social sciences); (2) mathematics and the basic physical and biological sciences; and (3) courses in the areas of professional instruction—medicinal chemistry, pharmacology, pharmaceutics, pharmacy administration, pharmacy practice, and clinical pharmacy.

The curriculum offers a well-balanced blend of academic classroom and cooperative education work experiences. Students completing the five-year baccalaureate pharmacy degree at Northeastern complete up to 3,000 hours of combined co-op and clinical clerkship experiences. These experiences, we believe, enable our students to easily make the transition into pharmacy practice upon graduation. The classroom experience is well-structured and allows for the integration of the students' cooperative learning experiences. As is the case with other pharmacy programs across the country, the curriculum is five years in length, but with a much greater practical experience base. The pharmacy program maintains close affiliations with many of the leading hospitals in the surrounding Boston area.

In addition, through the Graduate School of Pharmacy and Allied Health Professions, programs leading to the Master of Science and Doctor of Philosophy degrees are offered. A graduate program in clinical pharmacy leading to the Doctor of Pharmacy (Pharm.D.) degree is also available for a limited number of qualified baccalaureate graduates.

Graduation Requirements

Degree Candidates for the Bachelor of Science in Pharmacy degree must complete all prescribed work of the curriculum and meet the requirements of the Department of Cooperative Education before they become eligible for their degrees.

No student transferring from another college or university is eligible to receive a degree until the last three years of academic work immediately preceding graduation have been completed at Northeastern. Exceptions to this requirement may be made for students transferring from another college of pharmacy.

Graduation with Honors

Candidates who have attained superior grades in their academic work will be graduated with honors. Upon special vote of the faculty, a limited number of this group may be graduated with high honors or with highest honors. Students must have been in attendance at the University for at least six quarters before they become eligible for honors at graduation.

Accreditation

The undergraduate pharmacy program offered by the College of Pharmacy and Allied Health Professions subscribes to the standards established by the American Council on Pharmaceutical Education and the American Association of Colleges of Pharmacy, of which it is a member.

Licensure—Pharmacy

Pharmacists must meet certain requirements to obtain a license from the state in which they wish to practice. These requirements ordinarily include graduating from an accredited college of pharmacy, passing an examination given by a State Board of Pharmacy, and completing an "internship," or apprenticeship.

The internship is a period of supervised practical experience in a preceptor pharmacy. This is generally satisfied during the cooperative work periods commencing at the end of the student's second academic year. The salary earned during these periods of full-time employment may be used to help defray educational expenses. Students may apply up to 400 hours of the required academic clinical clerkship experience to their internship requirements. In addition, a college-directed externship adds to the total practice-oriented portion of the curriculum.

Sample Freshman-Year Program of Studies in Pharmacy**First Quarter**

Basic Calculus*
 General Chemistry
 Arts and Sciences Electives

Second Quarter

Calculus
 Professional Dynamics in the
 Health-Care Delivery System
 Biology
 English

Third Quarter

Biology
 English
 General Chemistry
 Arts and Sciences Elective

**Students who are not adequately prepared may need to take other math courses.*

In addition to the above courses, students may choose to take Basic ROTC.

Basic Course Requirements**I. General Requirements**

Course	Q.H.	Course	Q.H.
Basic Calculus*	4	Anatomy-Physiology	10
Calculus*	4	Biochemistry	5
General Chemistry*	10	Arts and Sciences	
English*	8	Electives (7)	28
Biology*	8	Social Psychology†	4
Physics†	8		
Organic Chemistry†	10		

II. Professional Requirements

Course	Q.H.	Course	Q.H.
Basic Pharmacy†	3	Professional Electives (3)	12
Pharmaceutics I & II, including Laboratory	11	Professional Practice Lab	1
Medicinal Chemistry/ Pharmacology I-III	16	Clinical Pharmacotherapy	5
Drug Analysis	5	Pharmacokinetic Principles in Drug Therapy	4
Drug Information & Evaluation	3	Caring for Patients: Psychosocial Aspects of Illness	4
Pathology	4	Pharmacy Management	4
Toxicology	4	Anti-Infectives	5
Biopharmaceutics/ Pharmacokinetics	4	Parapharmaceuticals	2
Pharmacology Lab I & II	2	Non-Prescription Medication	4
Jurisprudence	4	Interpersonal Skills for Health Professionals	4
Pharmacy Administration	4	Pharmacy Externship	4
Clinical Pharmacy Clerkship	15		
Professional Dynamics in the Health-Care Delivery System*	4		

*These courses are usually taken in the freshman year.

†These courses are usually taken in the sophomore year.

Toxicology

David R. Brown, Sc.D., *Associate Professor and Director*

Associate Professor

Robert A. Schatz, Ph.D.

Professional Preparation

Aims Toxicology is the study of the injurious effects of substances on living organisms. It is often considered a subdivision of pharmacology, the study of chemical interactions between substances and biological systems. Toxicology can be considered as the science that defines the limits of safety of chemicals and other substances. Thus, one of the chief responsibilities of the toxicologist is prediction. By gathering sufficient data on the identification and toxicity of materials and adequate knowledge of the mechanisms by which effects are produced by materials, the toxicologist can make reasonable predictions of their hazard and impact in the biosphere.

The activities and contributions of toxicologists are many and varied. The profession's subdivisions of materials, radiation, and veterinary toxicology illustrate the diversity of investigations in which toxicologists may participate. The toxicologist working in the biomedical area is concerned with intoxications by drugs and other chemicals as well as the demonstration of drug safety or danger prior to release on the market.

Clinical toxicologists may be involved with:

1. antidotal treatment of poisoning
2. drug abuse, addiction, and detoxification
3. drug monitoring and drug interactions
4. teratogenesis (drug-induced birth defects) and other toxicity-screening procedures

Industrial or environmental toxicologists are concerned with the recognition, identification, and quantitation of relative hazard from occupational or public exposure to toxicants. This concern is closely related to private and government responsibilities to ensure the safety of workers and the general public in contact with industrial and commercial products.

Industrial or environmental toxicologists may be involved with:

1. chemical carcinogens
2. pesticides or other "economic poisons"
3. air, soil, and water pollution
4. food additives

Forensic toxicology is a hybrid of analytical chemistry and fundamental toxicological principles, and is concerned with the medicolegal aspects of the harmful effects of chemicals.

Forensic toxicologists may be concerned with:

1. the cause of death in postmortem investigations
2. isolation and detection of toxicants in biologic material
3. drug-abuse monitoring programs
4. medicolegal aspects of poisoning

The faculty of Northeastern University's College of Pharmacy and Allied Health Professions feels that increased concern over the safety of drugs, chemicals, and cosmetics in the human population and in the environment, as well as new legislation regarding toxic substances, creates a high demand for toxicologists at the Bachelor of Science level. One of the College's principal goals is to help train qualified professionals who will strive to meet the health-care needs of society. The concept of an undergraduate degree in toxicology is brought about by the demands of an increasingly complex chemical environment. Currently, few institutions offer B.S. degrees in toxicology, although more schools are planning such programs. Yet there is an estimated need for 5,000–10,000 people with bachelor's degrees to act as technical support staff for Ph.D.-level toxicologists.

Northeastern University has created an innovative program in which its diverse academic resources offer training to this new breed of toxicologist. The core curriculum is enhanced by contributions from the University's Institute of Chemical Analysis, Applications, and Forensic Sciences, the Northeastern University Marine Science Institute in Nahant, and the Environmental Engineering faculty.

Recent manpower studies sponsored by private and federal agencies predict a great demand for toxicologists. Although a need for toxicologists existed prior to 1970, the introduction of numerous federal and local laws aimed at protecting the environment, safeguarding employees in their workplace, and protecting consumers against hazardous household products has created a critical shortage of toxicologists. Employment opportunities are being created in industry (chemical, cosmetic, and pharmaceutical firms) and government (for example, Environmental Protection Agency, Food and Drug Administration, National Institute of Occupational Safety and Health) as well as in police departments and various clinical settings. Students may also consider entering graduate programs in toxicology.

A View of the Five-Year Major The Toxicology program leads to the Bachelor of Science degree in five years under the cooperative plan. The curriculum is a combination of liberal arts, science, and professional courses that offer students the opportunity to prepare themselves to practice toxicology in a variety of settings. Required and elective professional courses may be selected from Medical Laboratory Science, Chemistry, Biology, Sociology, Criminal Justice, Computer Programming, Mathematics, and Earth Sciences.

Toxicology students begin their cooperative experience in the sophomore year.

Degree The degree granted will be the Bachelor of Science in Toxicology.

Sample Freshman-Year Program of Studies in Toxicology

First Quarter

Mathematics
Elective
Biology
English

Third Quarter

Calculus
English
Arts and Sciences Elective
General Chemistry

Second Quarter

Calculus
General Chemistry
Biology
Elective
Professional Dynamics in the
Health-Care Delivery System

In addition to the above courses, students may choose to take Basic ROTC.

Basic Course Requirements

I. General Requirements

Course	Q.H.	Course	Q.H.
Math*	4	Anatomy-Physiology†	10
Calculus*	8	General Biochemistry	5
General Chemistry*	10	Clinical Biochemistry	4
English*	8	Microbiology	4
Biology*	8	Biostatistics and	
Physics†	8	Computers†	4
Organic Chemistry†	10	Identification of Organic	
Environmental Problems†	4	Compounds	3
		Instrumental Analysis	5
		Electives	44

 II. Professional Requirements

Course	Q.H.	Course	Q.H.
Drug Analysis	5	Drug Interactions	4
Medicinal Chemistry/ Pharmacology I-III	16	Public Health	4
Identification of Drug Abuse	4	Epidemiology	4
Pathology	4	Medical Laboratory Science	5
Toxicology I, II, III, IV	16	Professional Dynamics in the Health-Care Delivery System*	4
Pharmacology Laboratory I, II	2		
Toxicology Laboratory	2		

*These courses are usually taken in the freshman year.

†These courses are usually taken in the sophomore year.

Physician Assistant

Suzanne B. Greenberg, M.S., *Director*

Professional Preparation

Aims This is a program for the education of the primary-care physician assistant, a skilled person qualified by academic and clinical training to provide patient services under the supervision and responsibility of a doctor of medicine. The Physician Assistant may work in a variety of settings, such as a physician's office, clinic, hospital, or nursing home. It is expected that the Physician Assistant will be able to do at least the following: elicit a detailed and accurate history, perform a physical examination, perform routine procedures such as the drawing of blood samples, give injections, suture and care for wounds, counsel the patient on matters relating to health, and provide evaluation and treatment in life-threatening emergencies.

A View of the Major This twenty-two-month program, which begins in September, includes didactic work and clinical rotations in medicine, surgery, pediatrics, emergency medicine, psychiatry, obstetrics, gynecology, and primary care at teaching hospitals. Students have the option of selecting up to one month of elective rotations in disciplines such as cardiology, dermatology, neurology, radiology, and the like. Clinical electives must be approved by the program and may vary in length from one to four weeks. Upon satisfactory completion of the program, students will be awarded a certificate by the University and are eligible to take the National Certifying Examination given by the National Commission on Certification of Physician's Assistants. Some states require successful completion of this examination in order to practice.

Special Requirements Applicants to the program must have successfully completed a minimum of three years of college, including courses in chemistry and biology at the college level. (Since the educational attainment of a majority of applicants exceeds the minimum requirements, those accepted often hold baccalaureate degrees.) In addition, successful applicants must have had at least one year of direct patient-care experience. The program is not designed for the high school senior entering an institution of higher learning for the first time.

Scholastic Aptitude Test scores are required for applicants. Application materials may be obtained by contacting the Physician Assistant Program Office at 202 Robinson Hall or by telephoning (617) 437-3195.

Accreditation

The Physician Assistant program meets the requirements established by the Council on Medical Education of the American Medical Association as essential for an approved educational program to provide students an opportunity for training as primary-care physician assistants. Membership in the Association of Physician Assistant Programs is maintained. The program is also approved by the Massachusetts Board of Approval and Certification of Physician Assistant Programs.

Other Information

This program is offered by Northeastern University in cooperation with the Massachusetts Medical Society and the Office of Special Programs in the Department of Health and Human Services. Lecturers for the program include faculty from medical schools in the Boston area.

Sample First-Year Program of Studies in the Physician Assistant Program

First Quarter

Human Anatomy
Essentials of Physical Diagnosis
Principles of Interviewing
Basic Medical Laboratory
Science
Pathophysiology and Medicine I
Roles, Rules, and Resources for
Physician Assistants
Medical Physiology

Second Quarter

Principles of Obstetrics and
Gynecology
Pathophysiology and Medicine II
Physiologic Basis of Disease:
Neurology
Principles of Pediatrics I
Principles of Psychiatry
Basic Diagnostic Radiology
Basic Pharmacology

Third Quarter

Pathophysiology and Medicine
III
Principles and Concepts of
Surgical Intervention in
Disease Processes
Principles and Concepts of
Emergency Medicine
Fundamentals of
Electrocardiography
Principles of Orthopedics
Introduction to Clinical Practice
Principles of Pediatrics II

II. Professional Requirements

Course	Q.H.	Course	Q.H.
Medical Care and Current Social Problems	2	Basic Medical Laboratory Science	3
Essentials of Physical Diagnosis	5	Basic Pharmacology	3
Principles of Interviewing	2	Medical Therapeutics	3
Principles of Psychiatry	3	Survey of Rehabilitation Medicine	2
Physiologic Basis of Disease: Neurology	2	Basic Diagnostic Radiology	2
Pathophysiology and Medicine I, II, & III	6	Principles of Obstetrics and Gynecology	3
Principles of Pediatrics	3	Fundamentals of Electrocardiography	2
Principles and Concepts of Surgical Intervention in Disease Processes	3	Roles, Rules, and Resources for Physician Assistants	2
Clinical Nutrition	3	Patient Education and Counseling	2
Medical Ethics	3	Principles and Concepts of Emergency Medicine	3
The Aging Process	3	Applied Study I, II, III, IV, V, & VI	24
Human Anatomy	2		
Medical Physiology	6		
Principles of Orthopedics	3		

Respiratory Therapy

Thomas A. Barnes, Ed.D., *Associate Professor and Director*

Associate Professor

Patrick F. Plunkett, M.S.

Instructor

Margaret A. Stewart, B.S.

Assistant Professor

Mary E. Watson, M.Ed.

Professional Preparation

Aims Respiratory therapy is an allied-health specialty, instrumental in the diagnosis, treatment, management, and preventive care of patients with cardiopulmonary problems. These patients may be found in newborn nurseries, surgical and medical wards, emergency rooms, outpatient departments, and intensive care units of hospitals. They may be suffering from a variety of acute and chronic conditions that are either life threatening or disabling.

Patients suffering a multiplicity of disorders from head injuries may require supportive mechanical ventilation. With the assistance of sophisticated ventilatory and monitoring equipment designed specifically for artificial ventilation, respiratory therapists become an essential part of the critical-care team. Through proper respiratory care and management, many patients who would not have survived are now being returned to an active life. In essence, the respiratory therapist is a life-support specialist.

In the hospital, "Code Blue, Code 99, Dr. Heart, Dr. Pacemaker" are all calls that may signify a life-and-death situation of cardiac and/or pulmonary arrest. The calls alert respiratory therapists to respond as members of an emergency cardiopulmonary arrest team, working alongside physicians and nurses. Respiratory therapists become responsible for life support of the patient through airway management, artificial ventilation, external cardiac massage, and many other sophisticated emergency support measures.

While intensive respiratory care is essential, routine patient care is equally important. Working under physician's orders, respiratory therapists carry out specific therapeutic measures to assist respiratory-distressed patients. Respiratory therapists must be experts in providing and recommending specialized and selective therapeutic respiratory care. They must be competent in such areas as medical gas administration, including oxygen; humidification, aerosols, and intermittent positive pressure breathing (IPPB); bronchopulmonary drainage and exercises, cardiopulmonary resuscitation, mechanical ventilation, airway management, and pulmonary function studies; blood gas analysis; and physiologic monitoring. Because respiratory therapy procedures may alter the patient's physiologic status, astute patient care and observation by trained respiratory therapists are essential.

Respiratory therapists are involved in the treatment of cardiac and pulmonary ailments such as cardiac failure, asthma, pulmonary edema, emphysema, cerebral thrombosis, drowning, hemorrhage, and shock.

Medications are delivered in such forms as aerosols or sprays through mechanical devices. These medications are then transmitted through the airways so that they may act on local areas within the lungs, as well as be diffused into the body's circulatory system.

Respiratory therapists make use of a variety of testing techniques to assist in medical research and diagnosis of disorders. One example is the use of radioactive gases or aerosols which are then safely administered to the patient through the respiratory system. Various portions of the lung may be screened and evaluated for obstructions, restrictions, and other abnormalities. Another example is the securing of lung secretions for cancer diagnosis. The most common diagnostic examinations are the measurement of lung volumes and capacities, and flow patterns and pressures.

Today, the field of respiratory technology is expanding even more rapidly to keep pace with the demand for new techniques to cope with environmentally related problems such as smoking and air pollution. New techniques also have been developed for use in the treatment of gangrene, carbon monoxide poisoning, tetanus, and many other disorders. •

A View of the Major Students enter the College as majors in the Respiratory Therapy program. Mathematics, chemistry, and the physical, biological, medical, and health sciences offer the bases for professional instruction in Respiratory Therapy. English, psychology, and elective courses in the humanities and social sciences offer a general educational background. Clinical study at the affiliated hospitals provides the opportunity for direct patient care and the immediate application of highly specialized techniques.

Degree The curriculum leads to the Bachelor of Science degree in Respiratory Therapy and includes academic quarters at the University, a structured clinical program, and assigned co-op quarters. Successful completion of the first three years of the program makes students eligible for the first part of the examinations administered by the National Board for Respiratory Therapy.

Accreditation

This program is accredited by the American Medical Association.

Sample Freshman-Year Program of Studies in Respiratory Therapy

First Quarter

English Composition
General Chemistry
Basic Animal Biology
Respiratory Therapy Seminar I
Algebra and Trigonometry

Third Quarter

Microbiology
General Chemistry
Respiratory Therapy Seminar III
Elective
English Literature

Second Quarter

Calculus
Respiratory Therapy Seminar II
Basic Animal Biology
Physics
Professional Dynamics
 in the Health-Care
 Delivery System

Basic Course Requirements

I. General Requirements

Course	Q.H.	Course	Q.H.
Biology	8	Pharmacology	4
Anatomy and Physiology	10	English Composition and Literature	8
Microbiology	4	Arts and Sciences electives	16
General Chemistry	10	Arts and Sciences electives*	12
Organic Chemistry*	10		
Physics	4		
Algebra and Trigonometry	4		
Calculus	4		

II. Professional Requirements

Course	Q.H.	Course	Q.H.
Respiratory Therapy Seminars	3	Respiratory Care for the Critical Patient	4
Clinical Seminars	2	Introduction to Pediatric Respiratory Care	2
Advanced Clinical Seminars I, II, III, IV*	4	Cardiopulmonary Lab Technology	3
Professional Practice Labs I, II, III, IV	4	Cardiopulmonary Lab Practice	1
Cardiopulmonary Physiology	4	Clinical Practice I	6
Advanced Clinical Physiology*	4	Clinical Practice II	6
Cardiopulmonary Disease Foundations of Medical Science	4	Advanced Life Support Systems I, II*	8
Hospital Law and Ethics	3	Advanced Medical Monitoring*	4
Medical Terminology	2	Respiratory Care for the Neonatal Patient*	4
Introduction to Patient Care	1	Practicum in Critical Care I, II*	8
Introduction to Respiratory Care	2	Directed Study*	2
Respiratory Care for the Med-Surgical Patient	3	Professional Dynamics in the Health-Care Delivery System	4

*Additional requirements for the Bachelor of Science degree in Respiratory Therapy.

Basic College Compensatory Programs for 1982–1983

The Basic College Compensatory Education Program continues generally to encompass five courses, each bearing four quarter hours of credit, which are to be offered in the sequences indicated below. Certain freshmen may be assigned to any one of these course sequences as applicable on the basis of testing administered during orientation week.*

Fall

- 10.100 Mathematical Preliminaries I
30.101 Fundamentals of Writing I

51.146 Reading/Study Skills

Winter

- 10.110 Mathematical Preliminaries II
30.102 Fundamentals of Writing II

Specifically, 10.100 and 10.110 are to precede both the 10.104, 10.105, and 10.107 (non-business math) sequence and the 10.118, 10.119, and 49.249 (business math) sequence; 30.101 and 30.102 collectively replace 30.113 (standard Freshman Writing) and are to precede 30.114 (standard Introduction to Literature) and, in the case of Lincoln College, the 30.114–30.206 (Literature of Engineering) sequence.

Schedule for Continuation of Compensatory Programming in the Basic Colleges for 1982–1983

These courses are approved/disapproved for credit, except where noted, by the faculties of the individual colleges and are, therefore, subject to change.

	30.101* Writing I	30.102 Writing II	10.100* Math Prelim. I	10.110* Math Prelim. II	51.146 Read. Study Skills
Arts and Sciences	accepted	accepted	accepted	accepted	accepted
Bouvé Physical Therapy	not accepted	not accepted	not accepted	not accepted	not accepted
Bouvé Physical Education	accepted	accepted	accepted	accepted	accepted
Bouvé Rec. and Leis. Stud.	accepted	accepted	not accepted	not accepted	not accepted
Bouvé Health Education	accepted	accepted	accepted	accepted	accepted
Bouvé Teacher Prep.	accepted	accepted	accepted	accepted	accepted
Business Administration	accepted	accepted	accepted	accepted	not accepted
Criminal Justice	accepted	accepted	accepted**	accepted**	accepted
Engineering†	not applicable	not applicable	not applicable	not applicable	not applicable
Lincoln College	accepted	accepted	not applicable	not applicable	not accepted
Nursing B.S.	accepted	accepted	not accepted	not accepted	not accepted
Pharmacy and Allied Health Professions	accepted*** w/o credit	accepted	not accepted	not accepted	not accepted
Computer Science†	accepted	accepted	not applicable	not applicable	not applicable

*Graded pass/fail and therefore not included in the student's quality-point average.

**Freshmen in the College of Criminal Justice are not required to take a mathematics course in the freshman year. However, if need for compensatory mathematics is substantiated by a diagnostic examination, students can elect to take 10.100 or 10.110 to prepare themselves for 10.104 Fundamentals of Mathematics as upperclassmen.

***Although the College of Pharmacy and Allied Health Professions does allow 30.101 to appear on the permanent record, it will only allow 30.102 for credit. Students completing the 30.101–30.102 sequence will have to make up the four-credit elective which was displaced by 30.101.

†Although the Colleges of Engineering and Computer Science do not allow 10.100 or 10.110 to be taken for academic credit, they do offer a special course sequence in college calculus with algebra and trigonometry (10.144 and 10.145) for engineering freshmen judged to have deficiencies in mathematics. The courses involve students in extra hours of work in algebra and trigonometry, but cover the same material as do the regular freshman calculus sequences in the Colleges of Engineering and Computer Science.

University College Alternative Freshman-Year Program

Program Goals

Northeastern University's highly successful Alternative Freshman-Year Program is designed for students who want to go to college but whose high school records do not reflect their true abilities. Because it is structured to assist students in making the academic and social adjustments necessary for success in college, this program may be the answer for those who feel that their potential is not reflected by their high school records and/or believe that they are not ready to undertake a full college curriculum.

The Alternative Freshman-Year Program is specifically designed to help students strengthen their basic academic skills in writing as well as mathematics. While helping them gain confidence in their ability to do college-level work, the program also offers them an opportunity to sample different areas of study before committing themselves to a specific major. Through the combination of a carefully prescribed curriculum and the attention of professional counselors, each student is helped to establish a program suited to his or her individual needs. These same counselors are normally available on a continuing basis throughout the student's entire freshman year.

Developed in collaboration with University College, a division of Northeastern serving students who seek a flexible college program, the Alternative Freshman-Year Program has a proven record of success in assisting students to develop their full potential. Many students who began their college careers in the program have attained sophomore status and have continued on to regular degree programs at the University.

Program Structure

Students in the Alternative Freshman-Year Program begin with ten quarter hours of credit in their first academic quarter. In their second and third quarters, students accelerate their schedules of course work to take, respectively, fourteen and sixteen quarter hours of credit.

After completing at least forty hours of credit and achieving a cumulative quality-point average of 1.400 or better, students may generally continue, except as noted for Business, their degree programs within University College or transfer, with sophomore status, to the College of Business Administration or the College of Criminal Justice, or enroll as sophomore social science or humanities majors in the Boston-Bouvé College of Human Development Professions or the College of Arts and Sciences. In addition to the cumulative quality-point average of 1.400 or better, the College of Business Administration requires a 1.800 average in five key courses, namely, 10.118, 30.400, 30.402, 39.601, and 49.499.

Faculty and Resources

The University has carefully selected for the Alternative Freshman-Year Program faculty members who are aware of individual student goals as well as the needs of students working to adjust to a college program. Faculty and students meet in small classes of not more than twenty-five students.

As members of the program, students are considered regular Northeastern University day students even though they have unique schedules and a distinctively tailored curriculum. Therefore, they generally have access to all counseling services, physical education facilities, dormitory arrangements, and extracurricular programs at the University's main campus in Boston.

Alternative Freshman-Year students are encouraged to make extensive use of the up-to-date programmed learning resources available for self-instruction through Northeastern's Learning Resources Center on the Boston campus. For additional assistance, Alternative Freshmen are also frequently referred to the University's Reading Clinic and/or the Math/Writing Center on the Boston campus. A third and very important resource, the Counseling and Testing Center, is also available to students on both the Boston and Burlington campuses for personal and academic counseling, as well as for vocational testing and counseling.

University College Alternative Freshman-Year Program

Business Track: One-Year Program

Quarter 1			Quarter 2		
No.	Course	Q.H.	No.	Course	Q.H.
10.100	Math I*	4	10.110	Math II*	4
30.400	Fund. of English I*	4	23.309	Hist. of Civ. A	4
51.531	Integ. Language		30.402	Fund. of English II*	4
	Skills Dev. I*	2	51.532	Integ. Language	
				Skills Dev. II*	2
Total Quarter Hours		10	Total Quarter Hours		14
Quarter 3					
No.	Course	Q.H.			
10.118	Math. for Bus.	4			
23.310	Hist. of Civ. B	4			
39.601	Economics I	4			
49.499	Mgmt. & Org.	4			
Total Quarter Hours		16			

*Compensatory course.

**Criminal Justice, Education, or Arts and Sciences Track:
One-Year Program**

Quarter 1			Quarter 2		
No.	Course	Q.H.	No.	Course	Q.H.
23.309	Hist. of Civ. A	4	21.401	Sociology I	4
30.400	Fund. of English I*	4	22.401	Pol. Science I	4
51.531	Integ. Language		30.402	Fund. of English II*	4
	Skills Dev. I*	2	51.532	Integ. Language	
				Skills Dev. II*	2
Total Quarter Hours		10	Total Quarter Hours		14

Quarter 3

No.	Course	Q.H.
21.402	Sociology II	4
22.402	Pol. Sci. II	4
23.310	Hist. of Civ. B	4
	Elective	4
Total Quarter Hours		16

*Compensatory course.

Tuition and Fees

Tuition and fees for the Alternative Freshman-Year Program are the same as for students in the Basic Colleges (see page 218 for details). Payment of the standard tuition during the first three academic quarters of residence entitles students to forty-eight credit hours of instruction. Thus, those who take the forty programmed credits are entitled to an eight-quarter-hour tuition adjustment at the regular freshman rate.

Application Procedures

For further information on the Alternative Freshman-Year Program, or to request an application, please write or call:

Dean of Admissions
Department of Admissions
Northeastern University
360 Huntington Avenue
Boston, Massachusetts 02115
Telephone: 617-437-2200

Other Schools and Colleges of the University

Lincoln College

In addition to full-time curricula described earlier in this bulletin, Lincoln College offers interdisciplinary and certificate programs providing technological and professional development opportunities to meet special needs of the part-time student. These programs provide educational opportunities for students who must pursue full-time employment but who desire to initiate or continue their academic work.

The part-time evening program includes pretechnology preparatory courses and degree programs leading to the Associate in Engineering (A.E.), the Associate in Science (A.S.), and the Bachelor of Engineering Technology (B.E.T.). The B.E.T. and A.E. degrees may be earned in Civil, Mechanical, Electrical, and Computer Technology. The A.S. degree may be earned in Aeronautical Technology.

University College

Part-Time Evening Programs

University College is committed to the education of mature adult students who wish to live effectively in today's complex society. Programs are specifically designed to satisfy their changing professional, cultural, and social needs and interests.

Degree programs have been developed in thirty-nine major fields of study in business administration, arts and sciences, law enforcement, and health professions. Flexible curricula are offered on a part-time basis Monday through Saturday during day and evening hours convenient to adult students. Students may select single courses or may enroll in degree programs leading to the Associate in Science or the Bachelor's degree. Classes are scheduled in locations accessible to the urban and suburban communities. Students may attend classes at the Huntington Avenue Campus in Boston or the Suburban Campus in Burlington, Massachusetts, as well as at thirteen other off-campus locations north, south, and west of Boston.

Academic advisers are available by appointment day and evening in the University College Office of Academic and Student Affairs. They offer students assistance in planning a program suitable to their general educational and career objectives and answer questions related to degree requirements, course sequence, and proper scheduling of courses. Appointments may be arranged by calling the University College Office, 617-437-2400, or by coming in person to 102 Churchill Hall. There is no charge for this service. Academic advisers are also available during registration at all registration sites. No appointment is necessary.

University College also offers a variety of career and other support services to its students, including career-development courses and counseling, job-search seminars, counseling and testing services, placement services, and special courses for women interested in business careers.

For a copy of the current University College *Bulletin*, please write or call: University College, Northeastern University, 360 Huntington Avenue, Boston, Massachusetts 02115, telephone 617-437-2400.

Full-Time Day Programs

In addition to offering a variety of part-time undergraduate programs, University College also offers two full-time day programs in allied health—the Radiologic Technology Program and the Dental Assistant Program. The admission procedures for these programs differ from those of other programs in University College. Therefore, individuals interested in these programs are advised to call or write for further information to the program offices listed below.

Radiologic Technology Program

Stanley A. Bozen, *Director*

Professional Preparation

Aims The radiologic technologist is an important member of any health-care team. Combining a technical background with extensive training and skills, the radiologic technologist is trained to use X rays to produce a clear picture or radiograph of a patient's tissue, bone, or organ structure for evaluation and interpretation by a physician. Northeastern University's Radiologic Technology Program is designed to offer students the opportunity to prepare for entry-level employment opportunities as radiologic technologists.

A View of the Program The Radiologic Technology Program at Northeastern offers a combination of academic preparation and clinical experience. Enrolling a new class of students in September of each year, the program consists of lecture and laboratory sessions held at Northeastern and periods of clinical training at selected radiology departments in Massachusetts hospitals. The program requires twenty-eight months of continuous study. A two-week orientation period is held prior to the beginning of classes each September.

Degree Upon satisfactory completion of the program, students are eligible to apply for the Associate in Science degree and to sit for the National Registry Examination for certification as radiologic technologists.

Certified graduates may, if they wish, seek career opportunities in the diagnostic and therapeutic environments of clinics and hospitals. However, they may also explore opportunities for employment in production, quality control, and facilities inspection at industrial firms. Certified graduates may also decide to consider a program in radiation therapy, nuclear medicine, or ultrasound technology, or may choose to continue their education by applying for acceptance to a bachelor's degree program in health science or hospital management.

Accreditation

This program is accredited by the Committee on Allied Health Education and Accreditation of the American Medical Association and by the American Registry of Radiologic Technologists.

Application

For further information regarding the Radiologic Technology Program, or to request an application for admission, please contact:

Mr. Stanley Bozen, Director
Radiologic Technology Program
Northeastern University
244 Forsyth Building
360 Huntington Avenue
Boston, Massachusetts 02115
Telephone: 617-437-2818

Dental Assistant Program

Eleanor A. King, *Director*

Professional Preparation

Aims New knowledge, techniques, equipment and materials in the health sciences require an ever increasing number of trained technicians and assistants to support the professional health practitioner. This is especially true in the field of dentistry, as many dentists find they can increase their effectiveness by employing a certified dental assistant to work with them.

Under the supervision of the dentist, dental assistants help provide direct patient care. Such work offers a number of rewards. The dental assistant has an opportunity to participate in a variety of interesting activities in a stimulating work environment and is often responsible for diverse tasks, including development of the interpersonal skills required in relating to patients and in caring for their special needs during office visits.

Employment opportunities for dental assistants are highly varied. Because dentistry is a multiservice profession, the dental assistant may decide to work in general dentistry or in a specialty such as oral surgery, a field requiring the assistant to work with a surgeon in a manner similar to that of a nurse in a hospital. Other individuals may prefer to work with an orthodontist, whose diagnostic treatment and laboratory procedures are directed toward the prevention and correction of irregularly aligned teeth and related facial structures. Further career opportunities may be available in the fields of pedodontics, i.e., dentistry for children; endodontics, which involves treating the inner structure of the teeth; and periodontics, which is concerned with the tissues surrounding and supporting the teeth.

A View of the Program The Northeastern University Dental Assistant Program is offered in collaboration with the Tufts University School of Dental Medicine and other local clinical facilities. The program consists of thirty-seven weeks of full-time day instruction, with both lectures and laboratory sessions conducted at Northeastern University.

Credit The Dental Assistant Program includes the following noncredit professional courses: Dental Anatomy, Biology, Clinical Assisting, Radiology Theory and Practical, Nutrition, Dental Specialties, Medical Emergency, Dental Laboratory, Microbiology, Histopathology, Pharmacology,

Prevention and Plaque Control, and Practice Management. Additional courses, which do carry college credit, are required in English and psychology.

Students who successfully complete the program and pass the certification examination may petition for academic credit to be applied toward the Bachelor of Science degree program in Health Science offered by University College. Credits may also be applied toward the Bachelor of Health Education degree program offered by Northeastern's Boston-Bouvé College of Human Development Professions.

Accreditation

The Dental Assistant Program is accredited by the Council on Education of the American Dental Association. The program is designed to offer students the opportunity to prepare for the certification examination conducted by the Dental Assisting National Board, Inc.

Application

For further information regarding the Dental Assistant Program, or to request an application for admission, please contact:

Ms. Eleanor A. King, Director
Dental Assistant Program
Northeastern University
244 Forsyth Building
360 Huntington Avenue
Boston, Massachusetts 02115
Telephone: 617-437-2829

Graduate and Professional Schools

The following graduate and professional schools of the University offer day and evening programs leading to degrees.

Arts and Sciences

The Master of Arts degree may be earned in Economics, English, History, Political Science, Psychology, Sociology, and Social Anthropology. The Master of Science degree is available in Biology, Chemistry, Economic Policy and Planning, Mathematics, and Physics. The Master of Science in Health Science and the Master of Public Administration degrees are also offered. In addition, there is an Advanced Literary Study Program leading to the Certificate of Advanced Graduate Study, and programs leading to the Doctor of Philosophy degree in Biology, Chemistry, Economics, Mathematics, Physics, Psychology, and Sociology. Several degree options are offered in the interdisciplinary areas of law, policy, and society; clinical and forensic chemistry; sociology or social anthropology; and education. Most programs may be completed through either full- or part-time study.

Boston-Bouvé College of Human Development Professions

The Master of Science degree may be earned, with specialization in Physical Education, Physical Therapy, or Recreation and Leisure Studies. Graduate courses in Health Education are available as electives within the College and for special students. Programs may be completed through full- and part-time study.

The Master of Education degree may be earned with specialization in Community Mental Health Counseling, Curriculum and Instruction, Early

Childhood Education, Educational Administration, Educational Research, Human Development, Industrial Counseling, Rehabilitation and Special Education, School and College Counseling, or Speech-Language Pathology and Audiology. The Certificate of Advanced Graduate Study is offered in Counselor Education, Educational Administration, Rehabilitation Counseling, and Social Sciences. The Doctor of Education degree may be earned in Administration, with specialization in Community Mental Health Leadership and Practice, Counselor Education, Educational Administration, or Rehabilitation and Special Education.

The master's degree program in Speech-Language Pathology and Audiology is accredited by the Education and Training Board of the Boards of Examiners in Speech Pathology and Audiology.

Business Administration

A Master of Business Administration degree may be earned. The Graduate School of Business Administration offers a variety of programs to meet the needs and schedules of graduate business students. For those interested in pursuing an M.B.A. degree on a full-time basis, the Graduate School offers two program alternatives: a twenty-one-month Management Intern Program, which includes a six-month, paid professional internship; or a two-year traditional full-time program, which may include administrative or teaching assistantship opportunities. Individuals who wish to continue their full-time job responsibilities while earning an M.B.A. degree may consider the evening part-time program of study, the eighteen-month Executive M.B.A. Program for upper-level managers or the accelerated part-time High Technology M.B.A. for qualified technical specialists. The Master of Science degree in professional accounting is an intensive, full-time program specifically designed for liberal arts and other nonaccounting majors. In addition, there is a program for advanced study in business administration leading to the Certificate of Advanced Study in Business Administration.

Criminal Justice

The College of Criminal Justice offers both full- and part-time programs leading to the Master of Science in Criminal Justice degree and an interdisciplinary program leading to the Master of Science degree in Forensic Chemistry. Students enrolled in the Master of Science program in Criminal Justice may choose from among five major concentrations of study—administration and planning, criminal justice research, criminology, correctional counseling, and private security. The interdisciplinary Master of Science program in Forensic Chemistry, offered jointly with the College of Arts and Sciences, allows for an integrated survey of forensic science as utilized in criminalistics, toxicology, and related professional fields. The College also offers an interdisciplinary Ph.D. program in Forensic Chemistry in conjunction with the University's Institute of Chemical Analysis, Applications, and Forensic Science. This unique program is designed to provide the opportunity for preparation for research and leadership positions in forensic laboratories. The Chemistry Department is the registering department for two of the three specializations of this program—namely, forensic analytical chemistry and forensic materials science. The Toxicology Department in the College of Pharmacy and Allied Health Professions is the registering department for the third specialization in forensic toxicology, offered in conjunction with the College of Criminal Justice. Students in either program attend classes during late afternoon and evening hours.

Engineering

The Master of Science degree may be earned, with specification in the field of Chemical, Civil, Electrical, Industrial, or Mechanical Engineering, Information Systems, or Engineering Management, including a six-year program in Power Systems Engineering leading to both bachelor's and master's degrees in Electrical Engineering; a special five-year honors program in Mechanical, Industrial, or Electrical Engineering leading to both bachelor's and master's degrees; the Professional Engineer degree in Mechanical, Industrial, or Electrical Engineering; the Doctor of Engineering degree in Chemical Engineering; and the Ph.D. degree in Chemical, Civil, Electrical, or Mechanical Engineering. A special interdisciplinary program leading to the Master of Science in Transportation is also offered.

Law

The School of Law offers a full-time program of professional instruction, leading to the degree of Juris Doctor (J.D.). It is fully accredited by the American Bar Association and the Association of American Law Schools. There are no courses for part-time or evening students.

Unique among American law schools, Northeastern's School of Law features cooperative legal education. Under this plan, each student is required to work full time at law for participating employers for four calendar quarters during his or her second and third years, alternating with equal periods of full-time course work. This blending of academic study and practical legal work experience, after a traditional first year of intensive academic study, is designed to offer the best possible preparation for the actual practice of law. Cooperating employers include large and small private firms, government agencies, legal assistance and public defender organizations, judges, unions, corporate law departments and virtually every type of legal practitioner. Employers are located nationwide.

Because the school operates twelve months a year, students complete the program on the same schedule as more traditional schools.

Pharmacy and Allied Health Professions

The Master of Science degree is offered in Clinical Chemistry, Hospital Pharmacy, Medical Laboratory Science, Medicinal Chemistry, Pharmacology, and Radiopharmaceutical Science. The Ph.D. degree is offered in Biomedical Science with specialization in Medical Laboratory Science, Medicinal Chemistry, Pharmaceutical Science, Pharmacology, or Toxicology. An interdisciplinary doctoral degree is available in Forensic Chemistry, and the Doctor of Pharmacy (Pharm.D.) is offered in the graduate program in clinical pharmacy.

Professional Accounting

The Master of Science degree in Professional Accounting is offered as a concentrated 15-month program, designed for arts and sciences and other nonaccounting majors who anticipate careers in professional accounting and who wish to prepare for the CPA examination. The five-quarter course includes a three-month internship with a leading CPA firm in the middle or winter quarter, thus providing both practical experience and financial support.

New classes start in mid-June of every year.

Some of these programs are offered on the cooperative plan; others provide teaching and research fellowships for able candidates.

The Center for Management Development

Sponsored by the College of Business Administration, the Center for Management Development offers programs designed to provide opportunities for professional growth for middle and senior managers. Two programs are scheduled several times a year: the Management Development Program (MDP) and The Management Workshop. In both, participants are sponsored by their employers. The Center also designs and conducts special programs for a wide range of business organizations. The MDP is a graduate-level course in business for managers who already have had responsibility for a major task, function, department, division, or independent enterprise. Six weeks of in-residence instruction are extended over a period of several months (October to February, January to May, or March to June).

The Management Workshop offers a comprehensive outline of the major areas of business through three different programs of graduate-level content. The Management Workshop I, The Management Workshop II, and The Management Workshop—High Tech are each held one day per week (Fridays or Mondays) for either ten or twelve consecutive weeks during the September to June period. The Center can be reached by telephone at 617-437-3272.

The Center for Continuing Education

The Center for Continuing Education serves the community in a variety of ways. Programs range from public offerings of enrichment courses to state-of-the-art seminars in engineering concentrations; from short-term, first-line training sessions in supervisory skills to concentrated three-week sessions for corporate executives; from workshops in nursing and other health professions to comprehensive programs in graphic arts management and food preparation; from special concentration seminars developed for a particular client company to the nationally known Urban Mass Transportation Management Seminars conducted by Northeastern University in conjunction with the United States Department of Transportation. Telephone: 617-890-1134.

Insurance Institute

The Insurance Institute is sponsored by local insurance organizations and companies. It offers a number of noncredit courses in preparation for the Chartered Life Underwriter and Chartered Property-Casualty Underwriter designations, as well as for the General Insurance, Insurance Adjuster, and Risk Management Certificates. Telephone: 617-437-2506.



Part Three

Particulars of Education



Undergraduate Admissions

139 Richards Hall

Tel: 617-437-2200

Philip R. McCabe, M.Ed., *Dean*

Mary A. Zammitti, M.Ed., *Associate Dean and Director*

Assistant Directors

Steven B. Bissell, B.S.

Michael F. Clifford, B.S.

Eleanor W. Lambert, M.B.A.

Admissions Counselors

Viola F. Covington, B.A.

Robert D. Hunter, B.S.

Cornelius B. O'Leary, B.A.

To find a college or university that will suit personal needs and interests—a place where you can learn to feel at home and make sound preparation for a future career—is a goal of all students who plan to continue their education beyond secondary school. The goal can be achieved in a number of ways: by talking with enrolled students, faculty, and alumni; by reading catalogs; and by visiting college campuses. In fact, a college campus visit should be high on your list of priorities. Northeastern's Committee on Admissions extends a cordial welcome to all prospective freshman and transfer students and has planned a series of on-campus experiences to make a visit as worthwhile as possible.

The Admissions Conference

It is only natural that students should have many questions about Northeastern—its programs of study, its services to students, and the Cooperative Plan of Education. For this reason, the Committee on Admissions sponsors a series of Orientation Conferences for students. Offered at 10:00 a.m. and 2:00 p.m. on Mondays and Fridays from October 1 through May 1 (except for legal holidays), these conferences have been most successful in helping students become better acquainted with the University. They include comments by an admissions counselor, an informal question-and-answer period, and a multimedia presentation.

Special sessions are also held in the summer between July 1 and September 1. Further information about these summer conferences may be obtained from the Admissions Department.

Guided Tours

Student-guided tours of the campus are usually held daily, Monday through Friday, at 11:00 a.m. and 3:00 p.m. The admissions conference and the tour should both be scheduled in advance by writing or calling the undergraduate Admissions Office (617-437-2211). The opportunity to visit the University's facilities and to observe student life on campus is one important way to learn about Northeastern. Commuting students who wish to visit the University's Suburban Campus in Burlington are encouraged to do so. This will appeal especially to those whose home communities are located north or northwest of Boston.

The Interview

Although it is not required, a personal interview is generally regarded as an appropriate opportunity for students with special questions to meet with an admissions counselor. In studying the secondary school record, the counselor may discover some factor that merits further explanation. In this event, the applicant may be asked to arrange a visit to the Admissions Office. The interview, therefore, may be held at the request of the

student or the counselor. In most cases, contacts with Admissions personnel will be more beneficial if the *University Bulletin* has been carefully studied before the personal interview.

Special Note

Northeastern does not hold Saturday classes for students in the Basic Colleges; hence, guided tours cannot be provided at that time. A week-day visit to the University is recommended. However, special Saturday appointments may be arranged on a limited basis.

General Requirements for Entrance

An applicant for admission to Northeastern University has, ideally, completed a challenging secondary school program—a program that includes courses in English, foreign language, mathematics, laboratory science, and history. Proficiency in a foreign language is especially important for students entering the College of Arts and Sciences. But the overall school record has importance in itself, both as an indication of achievement in subjects critical to university study and as a reflection of a wise choice of electives. Candidates are encouraged to broaden their reading outside of class. The student who can communicate ideas, understand the meaning of words, and write effectively is at a distinct advantage. Most important, the high school transcript should provide clear evidence of sound study habits so vital to success in higher education.

Today's high school students have had the advantage of many innovations that have greatly enriched their experience—independent study, small group seminars, research projects, and off-campus experiences related to community service or future vocations. Northeastern is understandably interested in the growth of the work/study concept in many secondary schools, and the Committee on Admissions looks with favor upon the variety of these worthwhile experiences.

Preparation for Study in Engineering, Computer Science, Science and Mathematics, and Allied Health Professions

It is only natural that evidence of special aptitude and the highest possible level of preparation in the sciences and mathematics should be required for entrance to certain programs of study offered by the University. Such programs include:

College of Arts and Sciences*

Biology, Chemistry, Geology,
Mathematics, Physics

Boston-Bouvé College of Human Development Professions*

Physical Education
Physical Therapy
School and Community
Health Education
Speech and Hearing
The Teaching of Secondary
Science/Mathematics

College of Computer Science

College of Engineering

All programs

Lincoln College

Bachelor of Engineering
Technology degree program

College of Nursing

Bachelor of Science program

College of Pharmacy and Allied Health Professions

All programs

*See page 210 for additional majors offered by these Colleges.

Courses in science and mathematics vary greatly in terminology, teaching methods, and content. Applicants are encouraged, however, to complete the full sequence of such courses if possible. In science, this would usually include a full academic year of study and laboratory work in biology, chemistry, and physics; and, in mathematics, geometry, algebra 1 and 2, and a fourth year of trigonometry and/or analysis. Experience has shown that students in programs emphasizing mathematics and science need courses in the social sciences and humanities to be fully prepared for professional courses.

Preparation for Study in Business Administration

Candidates for admission must have successfully completed a strong preparatory program in high school, including courses in geometry, algebra 1, and algebra 2. While mathematics plays an important role in the total program, strong emphasis is also placed on liberal studies to effect an intellectual balance with liberal and appreciative courses.

Preparation for Study in the Social Sciences, Teaching, and Criminal Justice

Many candidates for admission have enjoyed their greatest success in areas other than mathematics-science. Their interests lie, quite naturally, in the study of the humanities and social sciences. Thus, such a student may choose to apply for admission to one of the following programs:

College of Arts and Sciences Broad and flexible programs are offered to meet a variety of student interests in African-American Studies, Art, Drama, Economics, English, History, Human Services, Journalism, Linguistics, Modern Languages, Music, Philosophy, Political Science, Public Administration, Psychology, Sociology-Anthropology, and Speech Communication. A wide selection of electives enables students to broaden horizons while developing depth in the field of their major.

Boston-Bouvé College of Human Development Professions Professional courses leading to the opportunity for *teacher certification* are based upon a strong foundation of liberal arts study in the humanities and social sciences. Elementary Education majors may focus on one of four areas: humanities, reading-language, social sciences, and special education. There is also a major in Early Childhood Education. Secondary Education majors may choose between English and social studies.

The College also offers majors in Human Services and in Recreation and Leisure Studies with emphases in a variety of areas including Recreation Management, Outdoor Recreation/Environmental Education, and Therapeutic Recreation.

College of Criminal Justice By its very nature, the program in Criminal Justice requires a strong base of liberal arts study before professional courses are introduced. Applicants for admission should therefore demonstrate an ability to succeed in their study of the behavioral, social, and human services.

Entrance Examinations (Freshmen)

Research clearly indicates that the best single predictor of college academic success is achievement in secondary school. Thus, this factor, together with the recommendations of the school counselor, weighs most heavily in the evaluation process. Although the Scholastic Aptitude Test and three Achievement Tests of the College Board are required, the Com-

mittee on Admissions does recognize that these test results do not measure such qualities as determination, imagination, and leadership.

English composition has to be one of the three required Achievement Tests. Students can choose the other two tests in subjects in which they feel most confident. Students whose native tongue is not English may substitute the Test of English as a Foreign Language (TOEFL) for the English Composition Test. No single schedule of testing is recommended, but applicants are advised not to take subject matter tests unless they are currently studying such subjects.

For full information about College Board Examinations, consult a school guidance counselor or write directly to:

The College Board
P.O. Box 592
Princeton, New Jersey 08540
or
P.O. Box 1025
Berkeley, California 94701

The American College Testing Program may be substituted for the College Board Testing Program. For full information, write to:

American College Testing Program
P.O. Box 168
Iowa City, Iowa 52243

Admissions counselors also will be glad to answer questions about these testing programs.

Advanced Placement

The University grants advanced placement credit to those students with a score of 3 or better in their Advanced Placement Examinations. Students may take the examinations in the following subjects: American history, art (history of art, studio art), biology, chemistry, classics (Virgil, lyric), English (composition, literature), European history, French (language, literature), German literature, mathematics (calculus AB, calculus BC), music, physics (physics B, physics C—mechanics, physics C—electricity and magnetism), and Spanish (language, literature).

Applicants are required to take the Advanced Placement Tests of the College Board in May.

College-Level Examination Program

The University cooperates with the College Board in its CLEP Program. CLEP provides a national program of five General Examinations and forty-seven Subject Examinations to evaluate nontraditional college-level education. Qualified students are encouraged to take the general and/or subject matter examinations of CLEP, so that college credit may be allowed upon entrance. In general, the Committee on Admissions accepts the score range recommendations of the College Board. Northeastern University has been designated a CLEP Testing Center. Inquiries may be addressed to Counseling and Testing Center, Room 302, Ell Student Center.

Carl S. Ell Scholars Program

The University is very interested in providing recognition to students for their high academic achievement and, for this reason, has recently introduced the Carl S. Ell Presidential Scholar award, named in honor of the University's second president.

Twenty-five freshman-year tuition scholarships are given to students selected for this academic achievement award.

Applying for Admission and Plans of Admission

Entry Dates

Northeastern University admits students to all programs in September. The University also has a January entrance date for most of its programs. In addition, transfer students may enter in certain programs in the April and June quarters.

The application should be filled out properly, signed, and forwarded to the Dean of Admissions, Northeastern University, Boston, Massachusetts 02115 together with a nonrefundable \$25.00 application fee. Checks should be made payable to Northeastern University. This fee may be waived in cases of extreme hardship as endorsed by the candidate's secondary school counselor or social worker. It is to the students' advantage to submit applications for admission promptly. Students are also responsible for making sure that their transcripts and College Board scores are submitted to the University.

Program Selection

Many students have difficulty in selecting a program of studies. For this reason, the University has introduced flexibility into its programs so that students may explore alternative fields or tailor their programs to personal goals. Freshman candidates have to indicate a choice of college and, in some cases, a major. In the College of Arts and Sciences, Business Administration, Computer Science, Criminal Justice, Engineering, Lincoln College, and Pharmacy and Allied Health Professions, students do not have to make a definite choice of major concentration or emphasis until the end of the freshman year and in some programs until the end of the sophomore year. There is also flexibility in choosing a major in the teacher preparation program offered by Boston-Bouvé College of Human Development Professions. In certain programs, a limited number of electives are available for freshman students.

Rolling Admission Plan

Under Northeastern's Rolling Admission Plan, candidates may be notified of their acceptance at a point in their secondary school careers when there is sufficient evidence that they will be able to profit from study at the university level. This may occur early in the senior year or after the results of College Board Examinations have been evaluated. In all cases of acceptance, candidates are to complete successfully the senior year of high school.

Students should note that enrollments are limited in some programs where the number of applications is expected to exceed campus resources.

Deferred Admissions Plan

An increasing number of students seek information about deferring admission, perhaps to travel or to improve their financial resources through employment before entering college. Accepted students who wish to participate in the Deferred Admissions Plan will be asked to describe the activities they plan for the year preceding enrollment. Information on the plan is available from the Admissions Department.

Early Admission—Juniors, Second-Semester Seniors

In certain cases, students may enroll at Northeastern prior to high school graduation. Such students may enroll at Northeastern either in September or January, thereby reducing the time to complete degree requirements by one year. A special form provided by the Admissions Commit-

tee requires the endorsement of the school principal or guidance counselor for early admission. Write to the Department of Admissions for further details.

Alternative Freshman-Year Program

The Alternative Freshman-Year (AFY) Program was developed in collaboration with University College, a division of Northeastern serving students who seek a flexible course schedule. The program may be ideal for those students who feel that their high school grades do not reflect their true abilities and/or believe that they are not ready to undertake a full college curriculum.

The AFY Program is specifically structured to assist students in making the academic and social adjustments necessary for success in college. Working with a counselor, students follow a prescribed curriculum designed to meet their individual needs and to help them sharpen basic academic skills in writing and mathematics while gaining confidence in their ability to do college-level work. In addition, the program also permits students to sample different areas of study before committing themselves to a specific major.

The full range of counseling services, physical education facilities, dormitory arrangements, and extracurricular programs is generally available to students enrolled in this program.

For further information about the Alternative Freshman-Year Program, see page 196.

Programs for Minority Group Students

Northeastern University deliberately seeks to expand educational opportunities for deserving minority-group students and to recruit promising students from economically and culturally disadvantaged backgrounds. In so doing, it has increased its guidance and other supporting services in order that such students may be assured the opportunity to succeed in their chosen fields of study. Supporting services include tutorial study and programmed instruction. These and other counseling services are provided by the University's African-American Institute.

Project Ujima Program

"Ujima" is Swahili for "collective work and responsibility." The purpose of Northeastern's Project Ujima is to assist disadvantaged minority-group students in developing their potential to the fullest extent.

The program is designed to help make students aware of their potential and to urge them forward with a sense of direction and purpose. Special programs such as minicourses, counseling seminars, tutorials, and training sessions are provided to meet the needs of these students.

Open Campus Courses

Under Northeastern University's Open Campus Plan, qualified high school students who can gain release from their schools are invited to take full-credit courses at Northeastern while they are still enrolled in secondary school. In this way, students are able to gain a better idea of the collegiate environment while they work toward college credit. For further information, write to the Admissions Department.

Cooperative Freshman-Year Program

College of Engineering Summer Quarter Each June, the College of Engineering enrolls a limited number of qualified students in all programs

under a special summer Cooperative Freshman-Year Program.

Students may enter Northeastern University in the June following completion of the senior or junior secondary-school year and complete the first quarter of their college freshman year from June to September.

Graduating high school seniors then continue their freshman academic programs or undertake cooperative work assignments. The first cooperative work assignment normally occurs either in the winter quarter (January to March) or in the spring quarter (April to June). Under special circumstances, and at the discretion of the faculty coordinator, freshmen may be placed in September, following completion of their first academic quarter. After this work assignment, the student will return to Northeastern and complete the freshman year. The exact schedule will be based upon the professional judgment of the Cooperative Education Department and the academic progress of the student.

By extending the freshman year, enrollees have the opportunity to defray a portion of their first-year expenses.

Following the summer term, juniors have the option of returning to their secondary schools with credits earned toward college degrees or staying on at Northeastern, with the permission of their secondary schools, as members of the freshman class. Students who choose to remain at Northeastern then have the opportunity to participate in cooperative work assignments similar to those held by graduating seniors, either in the fall or winter quarter. For additional information, write to the Admissions Department.

Orientation and Registration

The orientation and registration program, which begins with your arrival in September, officially launches your academic career at Northeastern.

The administration, faculty, and many upper-division students have planned several days of programs, faculty seminars, meetings, and special events designed to help you adapt to college life in general and Northeastern University in particular.

In addition to participating in regular registration operations, receiving class schedules, and purchasing books, you will meet with the dean and faculty members of your college, who will provide information concerning your planned academic major, courses, and career goals.

You will have the opportunity to attend "how to study" seminars, peer-counseling sessions, and many other informative events. The Department of Cooperative Education, for example, has planned meetings regarding job opportunities and school-work experiences.

You will be introduced to members of more than 130 student organizations, some of which you might choose to join. Guided tours of Boston's historical and cultural centers will also be available.

Freshman students are assigned to classes based on their choices of college and major, high school records, and a variety of placement tests taken during the orientation and registration program.

Skill and Competency Development

Responding to what is apparently a growing national need to improve basic writing, numerical, and reading/study skills among otherwise academically acceptable college freshmen, the University extends to freshmen in several of its participating Colleges the opportunity to enhance the likelihood of academic success as freshmen through voluntary enrollment in compensatory (i.e., development) courses.

Selection for such course work is based upon the correlation of com-

petency data derived from specifically prepared testing procedures administered during Orientation Week with pre-freshman academic credentials.

The freshman writing sequence, the mathematics sequence, and the reading/study skills course each year bear full credit in participating colleges.

Instructors, freshman advisers, and the Freshman Affairs Staff of the Dean of Students' Office are ready to assist involved freshmen in achieving success in their endeavors (see pages 194-195).

Special Students

A limited number of special students may be admitted to the Basic Colleges. Special students are not degree candidates and must meet criteria set by the college to which they are admitted.

Those admitted as special students usually have completed some college-level work. The following are among the applicants who may be considered:

- a college or university graduate who needs additional course work to prepare or qualify for a graduate program;
- individuals, recommended by deans or program directors, who need particular formal course work to meet professional requirements for certification;
- students who need several courses to complete degree requirements at another college or university, provided they have written approval from the appropriate college dean; others who are recommended by deans of the colleges to take courses leading to regular admission. In such cases, special-student enrollment should be limited to one academic quarter.

All special students will be charged a nonrefundable application fee of \$25. Before obtaining and paying for an application, the potential special student should consult a counselor in the office of the dean of the college offering the course(s) desired. Tuition will be at the quarter-hour rate in effect at the time and must be paid before registration is valid. Special students will be admitted to classes only when there is space available.

All special students must obtain approval from the office of the dean of the Basic College in which they wish to enroll prior to each quarter's registration, but will be required to pay the application fee only once.

International Students

International students are required to complete and file the regular undergraduate application at least six months before registration. They must meet all admission requirements, including the standardized tests administered by the College Board. All academic credentials should be translated into English before being forwarded to the Department of Admissions. After notification of acceptance, students must pay the required deposits and fully complete the University's Declaration and Certification of Finances Form by the date specified on the acceptance certificate before an I-20 Form can be forwarded.

All international students participate in the University's five-year cooperative education program. Only students in the College of Arts and Sciences may petition to complete their degree program in four years.

Northeastern University is authorized under Federal law to enroll non-immigrant alien students.

Students may obtain a copy of the *International Student Admissions Booklet* by writing to the Department of Admissions.

English Language Center

Before being considered for admission, international students whose native language is not English are required to demonstrate some English

language proficiency. This can be done by obtaining a score of 450 or better on the College Board's Test of English as a Foreign Language (TOEFL) or by successfully completing an approved English language course of study.

After acceptance, international students whose native language is not English will be required to complete the placement test administered by the University's English Language Center. The results of this test will be used to assign students to their English courses. Students with minimal English language skills will be assigned to the noncredit Intensive English Course. The level of course work required in English will determine the student's academic schedule.

Admission of Transfer Students

Students wishing to transfer into the Basic Colleges of Northeastern University may request advanced standing as upperclassmen on the basis of acceptable credits in an accredited two- or four-year institution or a technical institute.

Basic Requirements

Full details of the University's transfer policy are available in the *Transfer Booklet*. This publication will be mailed to you upon request. The basic requirements follow:

1. Only candidates who present satisfactory college records, appropriate to the course of study they wish to pursue, may be considered for advanced-standing credit.
2. Credit is generally given toward a Northeastern degree for any course reasonably equivalent to a course offered by Northeastern and completed with a passing grade at another institution.
3. Candidates must be in good standing and eligible to continue in the institutions they are currently attending.
4. Evidence of honorable dismissal is required.

Application Procedure

If September entrance is planned, complete an application for admission no later than July 1. In certain programs, enrollment is possible at the beginning of each Northeastern quarter of study. Complete information on entrance dates for transfer students with advance standing is available with the application. All transfer students are required to indicate their choice of major on the application.

Submit a high school transcript. Request that an official transcript from each college attended be sent, including a list of the courses that will be completed prior to the end of the academic year.

NOTE: Transfer students are not required to complete entrance examinations.

Orientation and Registration

All transfer students are required to participate in an orientation and registration program scheduled immediately before the beginning of classes. This one- to three-day program provides transfer students with the opportunity to meet with their faculty advisers and plan their course schedules. They will also meet with members of the Student Affairs Office and the Cooperative Education Department.

Required Deposits from Freshmen and Transfer Students

If the Committee on Admissions makes a favorable decision on a student's application, the student will be asked to submit a nonrefundable tuition deposit of \$100 by May 1. This deposit serves as an indication of intent to enroll and is applied to the first-quarter tuition account. A dormitory deposit of \$100 is due at the same time for the student who will reside in University housing. An additional room-assignment deposit of \$400 is also required before definite room arrangements are made.

Students applying for entrance dates other than September should read carefully their certificates of acceptance, which will indicate the required deposit dates.

General and Special Health Requirements

All Students

Prior to registration at Northeastern the Lane Health Center's Pre-entrance Physical Form is sent to each student upon acceptance. It is mandatory that each applicant return this completed form which includes the medical history. This examination *requires* a tuberculin test within six months of the registration date. A rubella titre test is also *required* for all students enrolling in any and all health majors. It is also *required* for all students who expect to have hospital affiliations. This test is recommended for all female students. All students whose academic program requires hospital affiliation are required by the hospitals to have proof of having had measles or immunization against measles when they were more than one year of age. Similarly, proof of immunizations against German measles is required unless a satisfactory antibody titre against German measles is demonstrated. This information must be forwarded to the University physician for review. Proper health clearance is considered a condition of admission.

Except in the most extreme instances, neither physical nor emotional problems are considered a bar to admission. In fact, we actively encourage handicapped students to become part of the University community. With pertinent information, we usually can make the adjustments to college life smoother and supply special aids when needed.

Sound health and physical fitness are especially important for students in Boston-Bouvé College of Human Development Professions and the College of Nursing and are required by their nonuniversity affiliations. Candidates for admission to the College of Nursing are required to receive special health clearance prior to enrollment. A repeat health examination by the Lane Health Center is given in the third year for physical therapy and physical education students in the Boston-Bouvé College of Human Development Professions and before the third and fifth years for students in the College of Nursing.

College Expenses

Students are advised that tuition rates, room-and-board charges, and fees are subject to revision by the Board of Trustees at any time. They should also note that the freshman year consists of three quarters of full-time study. The Cooperative Plan, whereby students may be gainfully employed, does not begin until the sophomore year.

The primary purpose of the Cooperative Plan is to provide invaluable on-the-job training, but it also can help make education possible without the accumulation of a large personal debt. Because of the Plan—and the University's determination to keep basic expenses as low as possible—many deserving students who might not otherwise be able to afford an education have attended Northeastern.

Expenses for the Freshman Year (Three Quarters)

Tuition for the freshman year, for those who enroll in September, is payable in three installments at the beginning of the fall, winter, and spring quarters. For those who enroll in January, payments are due at the beginning of the winter, spring, and summer quarters.

Board-and-room expenses for those living in University-sponsored residence facilities vary slightly according to the dormitory to which a student may be assigned. These costs are computed on the basis of a seven-day-a-week arrangement and are also paid in three installments at the beginning of each quarter.

Total Freshman Expenses

Application Fee	\$ 25.00
Tuition (Engineering, Lincoln College, Business Administration, Computer Science)	5,100.00
Tuition (All other colleges)	4,725.00
Board and Room (if applicable)*	3,600.00†
Student Center Fee	37.50†
Infirmery Fee (if applicable)	75.00†
Health Services Fee	220.00
Laboratory Deposit (if applicable; \$10.00 charge for extra cards)	30.00

The above list excludes personal expenses and expenses for books and supplies.

**This scale is for Speare and Stetson Halls. See Housing section, page 250.*

†Payable in three installments at the beginning of each freshman quarter: September 27, 1982; January 3, 1983; and April 4, 1983. For students who enroll in January, the dates would be January 3, 1983; April 4, 1983; and June 27, 1983.



Special Note

Nonrefundable deposits of \$100 for tuition and \$100 for board and room are payable not later than May 1. An additional nonrefundable deposit of \$400 will be required from those who request housing. These deposits are applied to the first-quarter costs. The board-and-room deposits reserve a space in a University dormitory.

Students who enroll in September usually will have a vacation period of thirteen weeks between the freshman and sophomore years. Generally, Northeastern students use this period to earn money toward tuition costs.

Northeastern University is a member of the National Association of College Admissions Counselors, and the University supports and adheres to the admissions and financial aid policies of the Association's "Statement of Principles of Good Practice."

Expenses for Upperclassmen

	Tuition for Arts and Sciences, Boston-Bouvé, Criminal Justice, Nursing, Pharmacy and Allied Health	Tuition for Engineering and Computer Science	Tuition for Business Administration
<i>Division A</i>			
September 21, 1982	\$2,250.00	\$2,400.00	\$2,350.00
April 4, 1983	2,250.00	2,400.00	2,350.00
<i>Division B</i>			
January 3, 1983	2,250.00	2,400.00	2,350.00
June 27, 1983	2,250.00	2,400.00	2,350.00
<i>Division C*</i>			
September 27, 1982	2,250.00	2,400.00	2,350.00
January 3, 1983	2,250.00	2,400.00	2,350.00
April 4, 1983	2,250.00	2,400.00	2,350.00

**Division C is the term used to denote the classification of students who are temporarily or permanently on a noncooperative academic year. Certain students in the College of Arts and Sciences may select a noncooperative four-year program. In other colleges, this program is temporary, sometimes required of transfer students to phase into the Cooperative Plan.*

Required Fees for All Students

Application Fee

A fee of \$25 is required when the application for admission is filed. This fee is nonrefundable.

Accident and Sickness Insurance

The University provides an excellent hospital insurance and student health program. All students will pay a nonrefundable University Health Service fee of \$220 per year. This fee will cover the group Blue Cross-Blue Shield program and the medical services provided to students by the University Health Service.

Student Center Fee

All students in the Basic Colleges on the Huntington Avenue campus are charged a fee of \$12.50 per quarter for the services available in the Student Center building.

Graduation Fee

The University requires a \$25 graduation fee from all candidates for a degree. This fee must be paid before the end of the fifth week of the last scholastic quarter in the senior year. Candidates in the College of Nursing are also required to pay a charge of about \$10 for their graduation pins.

College of Nursing Uniforms

Students in the baccalaureate degree program of the College of Nursing purchase uniforms in the fall quarter of the sophomore year.

College of Pharmacy and Allied Health Professions Uniforms

Students in Respiratory Therapy purchase uniforms in the spring quarter of the sophomore year.

Students in Dental Hygiene purchase uniforms in the fall quarter of the freshman year.

Students in Radiologic Technology purchase uniforms in the fall quarter of the freshman year.

Students in the Medical Laboratory Science programs purchase laboratory coats in the spring quarter of the freshman year. Co-op assignments to hospitals usually will require uniform purchases in the spring or summer quarter of the sophomore year.

Other Fees

International Student Fee

There is a one-time fee of \$200.00 charged to new, undergraduate international students, payable upon their acceptance at Northeastern.

Liability Insurance

Freshmen majoring in the Colleges of Nursing (Bachelor Degree Program and Special Program for R.N.s) and Allied Health (Respiratory Therapy), as well as all upperclass students in Nursing, Pharmacy and Allied Health Professions (excluding Health Records), and medical or health-related programs in Boston-Bouvé College of Human Development Professions, are required to carry liability insurance. A fee of \$18.00 is charged per year.

Payment of Tuition

All payments should be made at the Bursar's Office. Checks should be made payable to Northeastern University. Beginning with the second week of any quarter, students are not eligible to attend classes unless their tuition has been paid or specific arrangements have been made with the Bursar for a plan of deferred payment. Deferred payment of tuition entails a fee of \$10.

Late Payment Fee

A fee of \$100 will be assessed for failure to make, or arrange for, payments in accordance with the prescribed regulations.

Laboratory Deposits

Students taking laboratory courses should be prepared to purchase laboratory deposit cards from the Bursar as directed by the department offering the course. These deposits will be charged with deductions for breakage and destruction of apparatus in the laboratory. A charge of \$5 each is made for extra cards.

Reserve Officers' Training Corps—Uniform Deposit

Freshmen enrolling in ROTC make a deposit of \$25 to cover loss of, or damage to, ROTC uniforms and equipment. Any loss or damage exceeding the deposit will be charged to the student.

General

Students in the College of Nursing may expect to be assessed fees for clinical laboratory experiences. *Physical Education* majors pay a room-and-board charge for a resident program at the Warren Center in the spring quarter. *Recreation and Leisure Studies* students pay a fee for a one-week term of camping at the Warren Center. A one-week session in winter sports is optional for Recreation and Leisure Studies majors in their junior or senior year (at a cost of \$175).

Refunds

The University provides all instruction on an academic-quarter basis, for which students pay at the beginning of each quarter. Tuition refunds in all schools and colleges may be granted through the first four weeks of a quarter only when specific conditions are met and on the basis of the date appearing on the official withdrawal application. (Nonattendance does not constitute official withdrawal.) Questions regarding refunds should be discussed with the Dean of Students' Office. When approved, refunds are made as follows:

Tuition Refund

Official Withdrawal Filed Within	Percentage of Tuition Refunded
1st week of Quarter	100
2nd week of Quarter	75
3rd week of Quarter	50
4th week of Quarter	25

Room and Board

(New Freshman and Transfer Students)

Rental charges for rooms in University accommodations are refundable only in cases of withdrawal prior to the start of a quarter (except in special circumstances so adjudged by the University). The \$100.00 and \$400.00 deposits are not refundable. Board charges may be refunded for all unused portions when the food identification card is surrendered to the Office of the Dean of Students for Housing.

Overloads

Tuition covers the cost of each student's required courses for a quarter. In addition, a course worth one quarter hour of credit may be taken without added charge. However, any other additional courses will be billed as overloads to the students taking them.

Financial Aid

Charles M. Devlin, M.Ed., *Dean of Student Financial Services*

Financial assistance in the form of loans, grants, and work-study is available on an annual basis to qualified students. Undergraduate financial aid funds are administered in accordance with a nationally established policy and philosophy of financial aid for students pursuing a degree in higher education. It is a basic premise of this policy that parents have an obligation to pay for the education of their children to the extent that they are able to do so. Financial aid is available only for meeting the difference between the students' potential resources (parents' contribution, summer or co-op earnings, outside agency awards, etc.) and their annual educational costs. The parents' contribution is determined by an objective analysis of the family's financial state: net income, number of dependents, allowable expenses, indebtedness, and assets. Criteria established by the College Scholarship Service are used in making the evaluation.

The University does not award any form of financial assistance to students who are not citizens or permanent residents of the United States.

Application Procedure

Initial Year (Freshman and Transfer Students) Applicants seeking financial assistance for their freshman year are required to submit a copy of the Financial Aid Form (FAF) to the College Scholarship Service by February 15 for summer or fall entrance or by October 15 for winter and spring entrance. The FAF is available from secondary school guidance offices or the Office of Financial Aid.

On the FAF you must indicate that you want copies sent to Northeastern University (3667), The Pell (Basic Educational Opportunity) Grant Program, and your state scholarship program (if applicable).

After the Office of Financial Aid is notified by the Office of Admissions of your acceptance, a status report is sent to you, which indicates the anticipated cost of education, parents' contribution, student's contribution, family contribution, financial need, and your anticipated Pell Grant eligibility.

Awards are made on a *first-applied, first-aided basis and are contingent on continued funding*. The typical award takes the form of a package combining a grant, a loan, and part-time employment. Awards may be adjusted at any time upon receipt of other funds or changes in status.

Transfer students also are required to file transfer transcript supplements from all previously attended post-secondary schools by April 15 for summer and fall entrance or by October 15 for winter and spring entrance.

Application Procedure

(Sophomore–Senior) Applicants seeking financial assistance are required to submit an FAF form to the College Scholarship Service each year they apply for assistance. Upperclass applicants are also required to submit one “Upperclass Application for Financial Aid” in each of their upperclass years and to file for the Pell Grant and submit the results of that application to the Office of Financial Aid as soon as possible.

Because financial aid awards are usually made for the entire academic year, applications should be filed prior to the following deadlines:

Fall and Spring Quarters	April 15
Winter and Summer Quarters	August 15

See information concerning state scholarships and the Federal Pell Grant.

Eligibility and Selection

In order to be eligible to participate in the financial aid program at Northeastern University, all students must: a) apply for financial aid, completing the proper application forms and submitting them in a timely fashion; b) ascertain financial need; c) be in attendance at Northeastern University, pursuing a first academic degree on at least a half-time basis in an eligible program; d) be making normal academic progress as determined by the college in which the student is enrolled; e) meet any other eligibility requirements of the individual aid programs.

Northeastern University makes every effort to meet the full apparent need for aid from applicants. Selection of applicants for awards is based on the following criteria: highest need and high academic achievement or potential for academic achievement. Aid is granted on the basis of availability of program funds.

Most students who attend Northeastern University move along with their class. On request, information about retention and attrition can be obtained from the Office of the Dean of Students.

Mail Inquiries to:

Northeastern University
Office of Financial Aid
P.O. Box 75
Boston, Massachusetts 02117

Office Hours

8:30 a.m. to 4:30 p.m., Monday–Friday

Telephone Numbers

General information	617-437-3190
Pell Grant information	617-437-3804
Help/GSL/Parent Loans	617-437-3386
Initial-year information	617-437-3191
Student Employment Center	617-437-3200

State Scholarship Programs

The Office of Financial Aid strongly advises applicants for aid to apply to state scholarship programs at the same time that they apply for aid from the University.

The Commonwealth of Massachusetts may provide scholarship aid to Massachusetts students pursuing full-time programs of study in an accredited college or university. Awards are made in the summer of each year, and applications for entering freshmen are available through their high school guidance offices. Out-of-state students should investigate aid programs in their respective states. Substantial state aid is offered by Connecticut, New Jersey, Pennsylvania, Rhode Island, Vermont, and Maine.

Federal Programs

Note: All Federal financial aid programs are subject to change, depending upon adequate and continuing Federal support.

Pell Grant (formerly Basic Educational Opportunity Grant)

This is a program of direct federal grants to undergraduate students only. Eligible students can receive as much as \$1,800 per year toward the cost of their education. Pell Grants are generally available to all students who have not previously received a bachelor's degree, who are not in this country on a student visa, and who are attending college on at least a half-time basis (minimum 6 quarter hours). To utilize this program to the fullest, all students applying for financial aid *must* file for a Pell Grant.

Applications for a Pell Grant can be made on the Financial Aid Form (FAF), which is available from local high schools or by calling the Pell Grant unit of the Financial Aid Office at 617-437-3804.

College Work-Study Program

This is a need-based program of part-time employment under the sponsorship of the federal government. It is designed to help full-time students meet their educational expenses. Students generally work part time while attending classes. Eligible students may work for the University or for public or private nonprofit off-campus agencies. The Office of Financial Aid has the responsibility of placing qualified students in their job assignments.

Supplementary Educational Opportunity Grant

Supplementary Grants are direct awards provided by the federal government. They are available to a limited number of full-time undergraduate students who present evidence of needing financial assistance. Eligible students who are accepted for entrance may receive Supplementary Educational Opportunity Grants ranging from \$200 to \$2,000 for each year of their undergraduate education.

Health Professions Loan

This program is available to full-time undergraduate students who have been accepted for a course of study leading to a Bachelor of Science degree in Pharmacy. A student who evidences financial need and academic promise may borrow as much as \$2,500 per academic year. Repayment of principal and interest does not begin until one year after the student ceases to pursue a full-time course of study. Repayment of principal may be extended over a 10-year period with interest at the rate of 7 percent per annum.

Guaranteed Student Loan Program

Under this program, students who are enrolled for at least one-half the normal academic work load may borrow from a participating bank or other financial institution. Terms and conditions vary from state to state, but the law allows dependent undergraduates to borrow a maximum of \$2,500 per year, up to a total of \$12,500, for undergraduate study. Independent undergraduates may borrow up to \$3,000 per year, with a total limit of \$15,000. The federal government pays the interest while the student is in school. The student must begin repaying the principal of the loan plus interest shortly after the student drops below half-time enrollment.

Applications for the loan itself are available from local banks or the Education Office of your state government. Additional information and necessary application forms for first-time borrowers are available from the Financial Aid Office.

Parent Loans for Undergraduate Students

Under the Parent Loan Program (PLUS), parents of dependent undergraduate students may borrow up to \$3,000 per year for each child enrolled in an approved educational institution. These loans are also offered by banks and other financial institutions, although terms and availability vary from state to state. Unlike the Guaranteed Student Loans, the PLUS loans require parents to begin repayment of the loan (with 14 percent interest) within 60 days of receiving the loan. Repayment may be stretched out over ten years, as long as the minimum monthly payment of \$30 is maintained. Applications and more information can be obtained from local lending institutions.

National Direct Student Loan

Direct Loans are available to students who present evidence of needing financial assistance. Undergraduate students may borrow up to a maximum of \$3,000 for the first two years, or a total of \$6,000 for their entire undergraduate education. Students are allowed a total maximum of \$12,000 through their undergraduate and graduate education. Repayment and interest on Direct Loans are not required until 6 months after a student graduates or withdraws from the institution. Repayment of principal may be extended over a ten-year period, with the interest rate at 5 percent per annum. Repayment may be deferred up to three years if the student is pursuing at least a half-time course of study or serving in the Peace Corps, VISTA, or the armed forces.

Nursing Student Loan

This program is designed for full-time undergraduate students who have been accepted for a course of study leading to an Associate or Bachelor of Science degree in Nursing. Provided financial need is evident, students may borrow as much as \$1,500 each year up to a maximum amount of \$6,000 for their entire undergraduate education. Repayment and interest on these loans do not begin until nine months after the student ceases to pursue a full-time course of study. The repayment of the principal may be extended over a 10-year period with the interest at the rate of 6 percent per annum.

Reserve Officers' Training Corps Scholarship Program

(Refer to section on Reserve Officers' Training Corps.)

University Scholarships

The following scholarships are awarded through the Office of Financial Aid. Because we award specific scholarships to the students who qualify, you should not apply for any specific scholarship. If you feel you are a potential recipient for any of these listed awards, you may bring that fact to our attention.

The Vivian B. Allen Scholarships Nursing

The Vivian B. Allen Foundation Endowment for nursing scholarships was established in 1968 through the generosity of the Vivian B. Allen Foundation, Inc. The income from a \$500,000 endowment fund is to be used to provide scholarship assistance for students entering or enrolled in the College of Nursing of Northeastern University. The application procedures and qualifications for selection are the same as those for all other scholarships.

Alumni Scholarships All Colleges

Scholarship aid is available to entering freshmen who are relatives of alumni. Applicants must show evidence of scholastic achievement and financial need.

Irving Aronson Scholarship Engineering

The Irving Aronson Scholarship for Electrical Engineering students was established through the generosity of the family of Irving Aronson as a living memorial to a man who shared his life with many people and who cared so much for the educational process. Income from this fund will be awarded or loaned to electrical engineering students who demonstrate financial need and academic responsibility.

George L. Barnes Scholarship All Colleges

This fund was established in 1969 by Miriam P. Poole, daughter of George L. Barnes, in memory of her father, a distinguished member of the Northeastern University Corporation and Board of Trustees from 1937 until his death in 1965.

The income from this fund will annually provide a full scholarship to a deserving student from Weymouth, Massachusetts. The award is made on the basis of need and character. Some additional assistance may be given in the upperclass years.

The Henry Francis Barrows Scholarships All Colleges

Established in 1949, the four Henry Francis Barrows Scholarships, provided under the will of Fanny B. Reed, are offered to Protestant young men born and brought up in New England. Good scholastic standing, good character, and need must be demonstrated by recipients of the scholarships.

The Barry Scholarship Engineering

The Barry Scholarship, established in 1973 by the Barry Division of Barry Wright Corporation, is available to students in the College of Engineering. Preference will be given to mechanical engineering majors and sons and daughters of Barry employees, based upon demonstrable financial need and academic achievement.

The Mr. and Mrs. Emil Matthew Bauer Fund All Colleges

The interest from the Fund, established in 1954, is used for scholarships or other financial assistance to students of German birth or of German extraction studying at Northeastern University. The scholarships are available to either men or women students enrolled in any year at the University.

Martin Brown Scholarship

Fund Engineering

This scholarship was established in 1961 by Mr. Martin Brown, an engineering alumnus of the Class of 1921. Its purpose is to assist qualified students enrolled in the College of Engineering who have need and have demonstrated above-average scholastic ability.

Wellington Burnham Fund

All Colleges

This fund provides financial assistance to worthy students of limited means without discrimination as to race, creed, color, or scholastic attainment. It was established in 1961 under the provisions of the will of George A. Burnham.

**The Godfrey L. Cabot
Scholarship Fund**

All Colleges

This fund was established by Dr. Cabot in 1954 to help meet the college expenses of employees or children of employees of Godfrey L. Cabot, Inc., and its subsidiary and associated companies. To be eligible, the employee must have completed at least five years of service with the company prior to the time the student enters the University. The University shall determine the number and amount of these scholarships, which are not limited to outstanding students and which are available to evening as well as day students. Students interested in applying for scholarship aid from this fund should communicate with the Cabot Personnel Office or the Office of Financial Aid at Northeastern University.

**Camp Dresser & McKee, Inc.
Scholarship**

All Colleges

This Scholarship was established in 1973 by Camp Dresser & McKee, Inc., and is available to students in all colleges. Preference for awards will be based upon demonstrable financial need and academic achievement.

**Louis S. Cashman Memorial
Scholarship Fund**

Business Administration

This Fund was established by the Massachusetts Credit Union Association (CUNA) and friends of Mr. Cashman in recognition of his outstanding service to the credit union movement in the Commonwealth of Massachusetts.

This scholarship is awarded annually to students in the College of Business Administration who have need, with particular preference given to those enrolled in Banking and Finance.

**The Gardner A. Caverly
Scholarship**

All Colleges

This scholarship was established in 1957 through the generosity of Mr. Gardner A. Caverly, an alumnus of the College of Business Administration and a member of the Class of 1934. Its purpose is to provide financial assistance and encourage qualified students from the New England area to attend Northeastern University. In selecting worthy students for these scholarship awards, preference is given to graduates of the Rutland, Vermont, and Laconia, New Hampshire, high schools.

**Carl W. Christiansen
Scholarship**

Business Administration

The Carl W. Christiansen Scholarship Fund was established in 1976 by Mr. Carl W. Christiansen, a graduate of the School of Commerce and Finance, Providence Division of Northeastern University, Class of 1923. Early in his career, Mr. Christiansen was an accounting instructor and associate dean in the Providence Division. In 1927, the accounting firm of Christiansen, Murphy and Company was founded, which in 1940 became known as Christiansen and Company—Certified Public Accountants. The income from this fund is to be awarded annually to an entering freshman in the day College of Business Administration who has demonstrated the necessity for financial aid. Preference will be given to students from the state of Rhode Island who are interested in pursuing a career in accounting.

Ruby H. Cole Scholarship

Fund All Colleges

The Ruby H. Cole Scholarship Fund was established in 1973 under the will of Mrs. Cole, late of Boston, Massachusetts. The income from the Fund is awarded annually to one or more female students enrolled in or admitted to undergraduate programs of the Basic College of the University and who are graduates of Roxbury High School, Roxbury, Massachusetts. Recipients must demonstrate financial need, academic stability, and soundness of character.

Commercial Union Insurance

Companies Scholarship

Criminal Justice

The income from this fund, established in 1982 by the Companies, will be used to provide a scholarship to an entering freshman who demonstrates need and shows promise of success in the law enforcement field.

Community Scholarships

All Colleges

The Community Scholarships were established by President Asa S. Knowles during the period 1963–1973. These scholarships stipulate that Northeastern will ensure that full freshman tuition be met in the form of scholarships and grants for qualified students.

In order to qualify for consideration, a student must apply for financial assistance through the normal application procedure and demonstrate need.

The following Massachusetts communities are designated under this scholarship program:

Boston: three scholarships at each of the several high schools; **Ashland:** three scholarships; **Burlington:** three scholarships; **Weston:** three scholarships; **Frammingham:** two scholarships; **Weymouth:** two scholarships; **Haverhill:** two scholarships; **Revere:** two scholarships; **Norwood:** two scholarships; and **Brookline:** three scholarships.

The Compugraphic Corporation

Scholarship Fund All Colleges

The Compugraphic Corporation Scholarship Fund has been established and endowed at the University with a generous gift from an individual. The income from the scholarship fund is to be used annually as financial assistance for persons who are admitted to or enrolled in full-time undergraduate programs of the Basic Colleges of the University and who demonstrate financial need, academic stability, and soundness of character. Scholarships are tuition grants and are awarded to persons who are otherwise eligible and who are, at the time of the grant, children of current employees of Compugraphic Corporation.

**Arnold L. Cormier
Memorial Scholarship**

Criminal Justice

The Arnold L. Cormier Memorial Scholarship Fund was established in 1980 by Joseph L. and Ruth E. Cormier in memory of their son, Arnold, a student in the College of Criminal Justice, Class of 1981. Arnold was a good student with excellent grades and was an active participant in classroom discussions and college activities.

His untimely death in an automobile accident, while on a weekend trip with two of his classmates, was a tragic loss to his parents and friends. To perpetuate the memory of Arnold Cormier and the spirit of good fellowship for which he stood, this scholarship is awarded annually to a senior in the College of Criminal Justice.

**Minette Cracknell
Memorial Scholarship**
Nurse Practitioner

The Minette Cracknell Memorial Scholarship Fund was established in 1979 through the generosity of family, friends, and colleagues of Mrs. Cracknell, a 1969 graduate of Northeastern's Nurse Practitioner Program. She was, in every sense, a pioneer in the nurse practitioner movement. The income from this fund is awarded annually to a nurse practitioner student who exemplifies the standards of excellence, selfless qualities, and high ideals characteristic of Mrs. Cracknell.

**The Salvatore J. and
Corinne Danca Scholarship**
All Colleges

The Salvatore J. and Corinne Danca Scholarship, established in 1974 by Salvatore J. Danca, a graduate of Northeastern University, Class of 1934, is to be awarded annually to a student enrolled as a sophomore. Selection will be made by the Committee on Scholarships, using academic excellence and financial need as the criteria for selection.

**Elizabeth A. Davey Scholarship
for Physical Therapy**
Boston-Bouvé College of
Human Development Professions

The Elizabeth A. Davey Scholarship for Physical Therapy students was established through the generosity of the family and friends at Choate Memorial Hospital on behalf of Elizabeth A. Davey, as a living memorial to a woman who shared her life with so many people. Income from this fund will be awarded or loaned to a Physical Therapy senior who demonstrates superior academic achievement and financial need.

**Charles M. Devlin
Scholarship** All Colleges

This fund was established in 1976 by the members of the Class of 1970 "in honor of our dedicated adviser," Charles M. Devlin. The income from the fund will be awarded annually to upperclassmen with proven ability and demonstrable financial need. Preference will be given to children of members of the Class of 1970.

**The William O. DiPietro
Scholarship** Engineering

This scholarship was established in 1967 through the generosity of Mr. William O. DiPietro, a distinguished alumnus of the College of Engineering and a member of the Class of 1942. The scholarship is awarded to one or more deserving freshmen who demonstrate a high caliber of achievement and a desire to fulfill the limits of their ability in both academic and cooperative periods of study. In considering recipients for this scholarship, preference is given to freshmen enrolled in the College of Engineering who have a desire to major in Chemical Engineering. It is intended that those students receiving awards from this scholarship might someday contribute to this or other scholarships themselves, thereby perpetuating growing funds that will help other deserving individuals.

**The Diamond Anniversary
Development Program
Scholarship** All Colleges

This scholarship has been established to commemorate the successful conclusion of the Diamond Anniversary Development Program. This scholarship fund recognizes the loyalty and generosity of the thousands of alumni and friends, corporations, foundations, and organizations whose significant contributions of time and resources have brought Northeastern University to "that greatness which is its destiny."

Three \$1,000 scholarships are awarded annually, as follows: to one or more full-time students enrolled in a cooperative education program within a basic college of the University, to one or more part-time students enrolled in a basic college of the University, and to one or more full-time students enrolled in the graduate division or a professional school of the University. Consideration will be based upon financial need, academic stability, and soundness of character.

**The Harry Doehla Memorial
Scholarship** All Colleges

The Harry Doehla Memorial Scholarship was established in 1974 in memory of Mr. Harry Doehla, founder and president of Doehla Greeting Cards, Inc. During his lifetime Mr. Doehla provided much financial assistance to young people of limited means to help them in furthering their educational goals.

The awards from this fund are available to undergraduate day students, with preference being given to graduates of Fitchburg High School, Fitchburg, Massachusetts, and Nashua High School, Nashua, New Hampshire. Additional consideration will be given to children of employees of Doehla Greeting Cards, Inc.

**The Cpl. James B. Downey
USMC Scholarship Fund**
All Colleges

This scholarship was established in 1970 through the generosity of Mr. William J. Downey, a graduate of the College of Liberal Arts, Class of 1952, in memory of his brother, Cpl. James B. Downey, USMC. The scholarship is to be awarded annually to an upperclassman in the day colleges who has demonstrated the necessity for financial aid.

**Agnes F. Driscoll Scholarship
Fund** All Colleges

This fund will provide scholarship assistance to students in their upperclass years who have demonstrated financial need and scholastic attainment.

**Carl Stephens Ell Alumni
Scholarships** All Colleges

To honor Dr. Carl Stephens Ell, the second president of Northeastern University, the Alumni Association established these scholarships in 1958. Either freshmen or upperclassmen enrolled at the University are eligible. Awards will be made to worthy students on the basis of scholastic ability and need. The scholarships are to be distributed as equitably as possible among students in the Basic Colleges and University College. Preference shall be given to sons and daughters of Northeastern Alumni.

**Elmer H. and Daisy M. Everett
Memorial Scholarship**
All Colleges

This scholarship was established through a bequest of Elmer H. and Daisy M. Everett, both alumni of Northeastern University. Mr. Everett graduated from the College of Engineering, and Mrs. Everett graduated from the School of Business. They are both members of the Class of 1934. Mr. and Mrs. Everett had a strong commitment to help young people wanting to further their education. The fund will be administered by the Office of Financial Aid.

**The George Raymond Fennell
Memorial Scholarships**
Business Administration

Two full-tuition scholarships are awarded each year to first-year students enrolled in the College of Business Administration. The scholarships are awarded in memory of George Raymond Fennell, formerly Assistant Director of Admissions and Director of the Northeastern Student Union.

**Clara and Joseph F. Ford
Scholarship Fund** All Colleges

A fund established by Clara and Joseph F. Ford to provide tuition scholarships for worthy, needy, and well-qualified students who have demonstrated a democratic and tolerant spirit and who are well disposed toward people of all creeds and races.

**The Gamma Phi Kappa
Fraternity Award Fund**

All Colleges

The Gamma Phi Kappa Fraternity Award fund, established in 1972 by the Brotherhood and Alumni of Gamma Phi Kappa Fraternity, is awarded to an entering freshman or undergraduate student in any of the Basic College day programs at Northeastern University. Preference for these awards will be based upon demonstrable financial need. Brothers of Gamma Phi Kappa Fraternity are not eligible for this award.

**The Nathan Gerber
Memorial Scholarship**

All Colleges

The Nathan Gerber Memorial Scholarship was established in 1974 by Albert Gerber, E52, and Robert Gerber, E60, in memory of their father, Nathan, a member of the Class of 1925. The scholarship is to be awarded annually to a student or students enrolled in the freshman class with a demonstrable financial need. Selection is made by the Committee on Scholarships.

The Foster Grant Scholarship

All Colleges

This scholarship, established in 1974 by the Foster Grant Co., Inc., of Leominster, Massachusetts, is available to students in any of the full-time undergraduate colleges. Preference will be given to children of employees of Foster Grant Co., Inc. Basis for the award will be demonstrable financial need and above-average academic achievement.

**Clifton W. Gregg Memorial
Scholarship**

All Colleges

This scholarship was established through a bequest of Clifton W. Gregg, a 1915 graduate of the School of Commerce and Finance of Northeastern University. It was Mr. Gregg's request that "the income from this fund be used for the assistance of financially needy students." The award may be made annually. Recipients will be determined by the Committee on Scholarships.

**Rabbi Myer O. Grunberg
Scholarship**

All Colleges

Established in 1953 by Mrs. Myer O. and Miss Rose Grunberg, this annual award is available to a senior student in any college of the University. The award is made to students who have evidenced in personal, business, and student relations those characteristics of leadership and human relations that make for a better social order. There is no restriction as to race, creed, color, or sex.

Charles W. Havice Scholarship

All Colleges

This scholarship was established by the members of the Student Union upon the retirement of the former Dean of Chapel, Charles W. Havice. The income from the fund is awarded annually to upperclass students who are active in the Student Union. Students should demonstrate a financial need.

**Charles Hayden Memorial
Scholarships**

All Colleges

The Charles Hayden Foundation, created by the will of the late Charles Hayden, an alumnus of the Boston English High School, offers annual memorial scholarships to freshmen at Northeastern University. The scholarships are awarded to "deserving boys" whose parents are unable to finance the entire cost of their education.

Kathryn S. Horbal Scholarship

Chemical Engineering

The Kathryn S. Horbal Scholarship for female chemical engineering students was established by Kathryn's family as a loving tribute to a daughter whose short life-time meant so much to so many. Income from this fund will be awarded to female chemical engineering students who have reached at least their middler year and who have demonstrated academic responsibility.

**Richard Melvin Horwitz
Memorial Award for Excellence
in Electrical Engineering**
Engineering

The Richard Melvin Horwitz Memorial Award for Excellence in Electrical Engineering was established in 1967 by Leonard J. Horwitz in memory of his brother, Richard Melvin Horwitz, a member of the Class of 1945 in the College of Engineering who died in action during World War II. The award recognizes academic achievement and excellence and is presented annually to an outstanding undergraduate senior majoring in Electrical Engineering.

**The Walter F. Howe
Memorial Scholarship**
Business Administration

This fund was established in memory of Walter F. Howe, Class of 1968, who, within one week after graduation, was fatally wounded while pursuing thieves who had stolen his landlord's car. The scholarship was established through the generosity of Walter's friends and relatives in memory of his ideals of good citizenship and civic responsibility. It is awarded annually to a student in the College of Business Administration who demonstrates not only financial need but good citizenship and civic responsibility. The scholarship is open-ended so that additional sums can be added to it in future years and will be awarded by the University without restrictions as to race, color, geographic origin, or scholastic attainment.

**The Edward L. Hurtig
Scholarship** All Colleges

This scholarship was established in 1968 through the generosity of the Hurtig family in memory of Edward L. Hurtig, an alumnus of the College of Engineering, Class of 1946. The scholarship is awarded annually to an entering freshman in the day colleges who has demonstrated the necessity for financial aid. Preferences will be given to recipients of the Supplemental Educational Opportunity Grants Scholarship Program of the United States Office of Education.

**The Maurice A. and Nellie L.
Idelson Award** All Colleges

This award, established in 1968, is given annually to an entering freshman in the day colleges who has demonstrated the need for financial aid. Preference will be given to graduates of the Boston English High School. Should there be no qualified candidate from this source, the award will then be given to any worthy student.

**The Jamaican Associates, Inc.,
Scholarship** All Colleges

The Jamaican Associates, Inc., Scholarship, established in 1981 by the Jamaican Associates, Inc., is awarded annually to a student who is a citizen of Jamaica and who intends to return to Jamaica upon graduation or to a student who is of Jamaican descent. Preference will be given to a second-year student with demonstrable financial need and proven academic performance.

**Joseph Anthony Johnson
Scholarships** Engineering

Established in 1968 by the will of the late Joseph Anthony (Johansen) Johnson of the Class of 1928, the income provides scholarship aid for students enrolled in the Department of Mechanical Engineering, with preference given to students of Scandinavian origin.

**Ralph P. Johnson Scholarship
Fund** Electrical Engineering and
Computer Science

Administered by the Office of Financial Aid and awarded to a Computer Science or Electrical Engineering major, this fund was established in 1980 by David R. Johnson, an alumnus of the Class of 1970, in honor of his father. It is the donor's desire that recipients of this fund assume the moral obligation to reimburse the fund in future years as they may be able in order to make additional financial aid available for other students.

**Dr. LeRoy C. Keagle Memorial
Scholarship Fund** Pharmacy

The Dr. LeRoy C. Keagle Memorial Scholarship Fund was established in 1975 through the generosity of family and friends of Dr. LeRoy C. Keagle, a man of high integrity and commitment to the profession of pharmacy who, at the time of his death on December 15, 1974, was Dean of the College of Pharmacy and Allied Health Professions at Northeastern University. The income from this scholarship fund is awarded annually to a student in the undergraduate Pharmacy Program who is entering the junior or senior class. Recipients must demonstrate financial need, academic stability, and soundness of character.

**Robert G. Keene Memorial
Scholarship Fund**
All Colleges

This fund was established in 1979 in memory of Robert G. Keene, a graduate of Lincoln College, Class of 1972. The endowment funds were provided by the friends and associates of Robert G. Keene and by the Polaroid Corporation, where he served as an Engineering Manager. The income from the fund will be awarded annually to an undergraduate student who demonstrates financial need as well as strong character and initiative. Primary consideration will be given to children of Polaroid employees.

**The Martin Luther King, Jr.,
Scholarship**

The Martin Luther King, Jr., Scholarship is granted annually to incoming freshman, graduate, and transfer minority students who have demonstrated the philosophy of peaceful coexistence and change through nonviolent means espoused by Dr. King and who have an above-average scholastic record. The scholarship, in the amount of \$500, requires a minimum grade point average. Financial aid based on need is available to supplement the scholarship.

**Vena Morse Lamson
Scholarships** All Colleges

These scholarships are provided through the income of a fund established in 1963 by Horatio W. Lamson in memory of his beloved wife. They are awarded annually to needy and worthy students who are enrolled in any of the Basic Colleges of the University. The scholarships are granted by the Committee on Financial Aid of the University without regard to national origin, sex, race, or creed.

**George M. and Irene M. Lane
Scholarship Fund**
All Colleges

This scholarship fund was established in 1979 by the family of Dr. George M. Lane to honor his memory. Dr. Lane's faithful and dedicated service to Northeastern University extended from 1943 to 1975, at which time he retired as Director of University Health Services. The income from the George M. and Irene M. Lane Scholarship Fund is awarded annually to an upperclass member of the University's varsity football or hockey team who demonstrates financial need, academic stability, and soundness of character. Additional family gifts as well as contributions from friends and associates may be added to the scholarship's endowment.

**The Irving Landfield
Scholarship** All Colleges

This fund was established in 1972 through the generosity of Irving Landfield, a graduate of the School of Commerce and Finance of Northeastern University, Class of 1923. The income from the fund is to be awarded annually to help deserving and needy students who demonstrate a desire to fulfill the limits of their ability in academic and cooperative periods of study. The income from this fund will be

administered and awarded by the University without restriction to race, color, creed, geographic origin, or scholastic attainment. It is Mr. Landfield's desire that recipients of the scholarship assume a moral obligation to contribute to the principal of this fund as they may be able, in order to make additional financial aid available for other students in later years.

**Avrom Aaron Leve Memorial
Scholarship** Psychology

This scholarship fund was established in 1957 in memory of Dr. Avrom Aaron Leve, former Assistant Professor of Psychology. The interest is used annually to provide scholarships for upperclass students majoring in Psychology. The award is made on the basis of academic achievement, financial need, and character.

**William F. Linskey
Scholarship Fund**
All Colleges

This fund was established in March 1980 by alumni and friends of William F. Linskey, an athletic trainer long associated with young athletes in and around the Greater Boston area. A former head trainer for the Northeastern University football team and head hockey coach during the 1942-'43 season, Linskey has served the City of Cambridge School Department as head athletic trainer and physical therapist for more than thirty years. The income from the fund will be awarded to worthy students pursuing courses leading to a Bachelor of Science in Education with a specialization in athletic training.

**Russell T. Lowe Memorial
Scholarship Fund**
College of Engineering

This fund was established in 1976 in memory of Russell T. Lowe, a graduate of the College of Engineering, Class of 1953. The endowment funds were provided by the friends and associates of Russell Lowe and by the Barry Wright Corporation, where he served as a member of the Board of Directors and as president of the Industrial and Aero Products Group. The income from the fund will be awarded annually to one or more upperclass students enrolled in the College of Engineering. Preference will be given to Mechanical Engineering majors based upon demonstrable financial need and above-average scholastic achievement.

**Gilbert G. MacDonald
Scholarship** All Colleges

This scholarship was established in 1981 by the family of Gilbert G. MacDonald, former Vice President for Student Affairs and Dean of Students, and the members of the Student Union. The income from the fund will be awarded annually to upperclass students of proven ability and demonstrable financial need. Preference will be given to students who actively participate in the Student Union.

**Dr. Reuben J. Margolin
Memorial Scholarship Fund**
Boston-Bouvé College of
Human Development Professions

The Dr. Reuben J. Margolin Memorial Scholarship Fund was established in 1973 through the generosity of family and friends of Dr. Reuben J. Margolin, an outstanding and dedicated individual and friend who, at the time of his death on April 6, 1972, was Chairman of the Department of Rehabilitation and Special Education at Northeastern University.

The income from the Dr. Reuben J. Margolin Memorial Scholarship Fund is awarded annually to a deserving student admitted to or enrolled in the Graduate School of Boston-Bouvé College of Human Development Professions and majoring in Rehabilitation and/or Special Education. Recipients must demonstrate financial need as well as the personal and professional qualities exemplified by Dr. Margolin.

**George T. Marvin
Scholarship Fund** All Colleges

This fund was established in 1961 under the provisions of the will of George T. Marvin, a graduate of the Northeastern University School of Law, Class of 1918. Mr. Marvin designated that the income of this fund should be used to provide financial assistance to worthy and needy students to assist them in furthering their education at Northeastern University.

George T. Marvin Scholarships may be awarded to new students seeking admission to Northeastern and to students enrolled as freshmen and upperclassmen. Applicants must have satisfactory records of scholarship as of the time of making application and must demonstrate genuine need and good citizenship.

**Merchants Tire Company
Scholarship Fund**
Business Administration

This scholarship was established in 1972 by Merchants Tire Company in honor of Max Katz, a Class of 1917 alumnus of Northeastern and founder and chairman of the board of Merchants Tire Company. The scholarship is awarded annually with selection preference given to a son or a daughter of a current employee of Merchants Tire Company enrolled as a freshman within the College of Business Administration, who demonstrates financial need, soundness of character, and academic stability.

**George H. Meserve, Jr.,
Scholarship Fund**
College of Arts and Sciences

This scholarship was established in 1979 through the generosity of Robert W. Meserve in honor of his brother, Professor George H. Meserve, Jr., an alumnus of the Class of 1925. Professor Meserve served Northeastern faithfully and with distinction for forty-two years, retiring in 1968 as Professor and Chairman of the Department of Art. Announced at the ceremony dedicating George H. Meserve Hall on the Boston campus, this scholarship benefits worthy undergraduate students who are majoring in Art. Recipients should demonstrate financial need, academic stability, and soundness of character.

**The Clyde W. Morrison
Scholarship Fund** All Colleges

The Clyde W. Morrison Scholarship was established in 1974 by Clyde W. Morrison, a member of the class of 1942. The scholarship is to be awarded annually to a Braintree resident enrolled as a freshman, with a demonstrable financial need. Selection is made by the Committee on Scholarships.

**Frederick W. Muckenhaupt
Scholarship** All Colleges

This award was established in 1961 by Dr. and Mrs. Carl F. Muckenhaupt in memory of their son, Frederick W. Muckenhaupt, Class of 1959 of the College of Engineering.

The award is to be made annually to a student in good standing, on the basis of need. Preference is given to a student enrolled in the Department of Electrical Engineering.

**Elizabeth A. Neilson
Scholarship**
Boston-Bouvé College of
Human Development Professions

The Elizabeth A. Neilson Scholarship Fund was established in 1976 in memory of William H. and Anastasia Neilson, exemplars of the profession of health education during their lifetimes. The income from the scholarship fund is awarded annually to a student(s) with the highest scholastic record majoring in Health Education, who has completed eight quarters of academic study with at least four quarters having been taken at Boston-Bouvé College of Human Development Professions. The student(s) must typify the philosophy of the health education profession.

**Thomas Anthony Pappas
Scholarship Fund** All Colleges

This fund was established in 1980 by the Thomas Anthony Pappas Charitable Foundation. Endowment income is to be used to provide scholarship assistance to needy students with high scholastic records.

**Power Systems Engineering
Grants-in-Aid**
Electrical Engineering

A number of public utilities and power equipment manufacturing companies in the northeastern part of the United States have made available grants-in-aid ranging from \$1,000 to \$5,000 to assist able freshmen who are interested in pursuing careers in power systems engineering through study programs leading to the Bachelor of Science or Master of Science in Electrical Engineering degrees. These awards are made on the basis of academic achievement in high school and aptitude for, and interest in, the field of power systems engineering, without regard to financial need.

Candidates for such grants-in-aid should apply to the Dean of Admissions at Northeastern University not later than March 1 of the year in which they wish to enter the College of Engineering.

**Lawrence Harlow Pratt Athletic
Scholarship Fund**
All Colleges

This fund was established in 1979 by the Northeastern University Varsity Club in conjunction with the Athletic Development Program Fund Drive to honor and recognize Lawrence Harlow Pratt. For more than four decades, Larry was the spirit of Northeastern athletics. His greatest joys were the young men he persuaded to attend college. He encouraged them, cajoled them, sometimes scolded them, but always inspired them to complete their intercollegiate careers and go on to become outstanding members of the community. The income from the fund will be awarded annually to financially deserving varsity athlete(s).

**The Gay Miller Reese
Memorial Scholarship**
Boston-Bouvé College of Human
Development Professions

The Gay Miller Reese Memorial Scholarship was established in 1971 by Everett Reese, in memory of his wife, and by members of the Class of 1921 at their 50th reunion in honor of their classmate and class president, Gay Miller Reese. This scholarship is to be awarded annually to help a well-qualified upperclassman in Boston-Bouvé College of Human Development Professions acquire the education that could not otherwise be possible. The recipient of this award will be selected by the Committee on Scholarships.

Regional Scholarships
All Colleges

Secondary school students who reside in rural areas of New England, who have demonstrated superior achievement in their studies, and who are strongly endorsed by their principals and guidance counselors may qualify for a Regional Scholarship. Scholarships range from \$200–\$1,400.

The Myer Riesman Scholarship
Nursing

This fund, established in 1969 in memory of Myer Riesman, is used to provide financial assistance to deserving students in the College of Nursing. Preference is given to those students whose clinical experience is at Beth Israel Hospital.

**Edward T. Rigney
Scholarship** All Colleges

A fund was established in 1978 by a grant from the Trans-Sonics Foundation in memory of Edward T. Rigney, member of the Class of 1941 and co-founder of Trans-Sonics, Inc. Income is awarded annually to a student showing financial

need and promise of success in his/her chosen field and who is enrolled in engineering, science, or science-related studies. The scholarship may be granted to a freshman or upperclassman and may be renewed in succeeding years.

Isedore Rosenthal Fund

College of
Business Administration

The Isedore Rosenthal Fund was established in 1981 by Mrs. Isedore Rosenthal and friends in memory of her husband, a distinguished graduate of the School of Commerce and Finance (1925) and the School of Law (1931). Income from the fund is to be awarded each year, based on financial need, to freshman accounting majors for the purchase of books and materials. It is the donor's desire that recipients assume the responsibility in future years to contribute to the principal of this fund as they may be able, in order to make additional resources available for other students in later years.

Frank B. Sanborn

Scholarship Fund Engineering

The Frank B. Sanborn Scholarship Fund was established in 1958 to provide a scholarship or scholarships of not more than \$500 to worthy and needy students selected by the University, without restrictions as to race, creed, or geographic origin, but with preference being given to students majoring in Electrical, Mechanical, Civil, or Industrial Engineering, in the order stated.

Recipients must be willing to assume a moral obligation to reimburse the fund as they may be able, to make similar financial aid available for other students in later years. There shall be no interest charged and no time specified for reimbursement.

Clinton H. Scovell Scholarships

Boston-Bouvé College of Human
Development Professions

Scholarships are made available to men and women students in Boston-Bouvé College of Human Development Professions through a fund provided by the will of Clinton H. Scovell.

**The Sidney L. Sholley
Memorial Scholarship**

All Colleges

The Sidney L. Sholley Memorial Scholarship has been established in memory of the founder and first president of Keystone Custodian Funds, Inc. Each year the trustees of the Sholley Foundation, Inc., provide a scholarship of \$3,500 to be awarded by the University to an outstanding incoming freshman student. The recipient is known as the Sidney L. Sholley Scholar.

**George A. and Lorraine C.
Snell Scholarship**

All Colleges

This fund was established in 1973 by Mr. George A. Snell, a graduate of the College of Engineering, Class of 1941, and a member of the Northeastern University Corporation and Board of Trustees, and his wife, Lorraine C. Snell.

The income from the fund is to be awarded annually to one or more students enrolled in the basic colleges of Northeastern University. Selection will be made by the Committee on Scholarships based upon those candidates who demonstrate financial need, academic stability, and soundness of character.

**John Stuart Sousa, Jr.,
Memorial Scholarship Fund**

Pharmacy

This scholarship was established in 1968 in memory of John S. Sousa, Jr., of Fall River, Massachusetts, a student in the College of Pharmacy, Class of 1969, by his family and friends. The scholarship is awarded annually with selection preference given to a student entering the senior year in the College of Pharmacy and Allied Health Professions who has obtained a cumulative quality-point average of 2.300, demonstrates financial need, participates in extracurricular activities, and is, preferably, a member of a fraternity or sorority.

**Southeastern Massachusetts
Pharmaceutical Association
Scholarship Fund** Pharmacy
and Allied Health Professions

This scholarship was established in 1980 by the Southeastern Massachusetts Pharmaceutical Association. The income from the fund is awarded annually to one or more middler, junior, or senior students enrolled in the College of Pharmacy and Allied Health Professions who are residents of the area covered by the Southeastern Massachusetts Pharmaceutical Association (Greater Fall River, Greater New Bedford, and the Cape Cod areas). Recipients must be Pharmacy majors and must demonstrate financial need, academic stability, and soundness of character.

**Lillian M. Spelman
Memorial Scholarship** Nursing

This scholarship was established in 1979 by a bequest from Lillian M. Spelman, a resident of Boston who, as a public health nurse, dedicated her life to helping others. Her career began in the West End of Boston in the early 1900s. She served her country unselfishly as a Red Cross nurse in Europe during the First World War. Through this scholarship she continues to help others. Scholarship recipients must exhibit financial need as well as academic stability and soundness of character.

Spofford Scholarship Fund
All Colleges

The Spofford Scholarship is awarded annually to an American Negro, American Indian, or multiracial freshman who demonstrates severe financial need.

**The Stop & Shop
Companies, Inc.,
Student Loan Fund**
All Colleges

Established in 1974 by The Stop & Shop Companies, Inc., the Student Loan Fund is a combination endowment and revolving fund to be funded by \$100,000. This generous gift recognizes the contribution, in human terms, made through the years by Northeastern to Stop & Shop, which at the time the Loan Fund was established counted more than 120 Northeastern men and women in its executive ranks, seven of them vice presidents.

The Loan Fund will assist students who have a substantial investment in their education but are in need of some financial stimulus to aid them in completing their work.

**Student Load Fund—
Health Professions**
Boston-Bouvé College of
Human Development Professions,
Nursing, and Pharmacy and
Allied Health Professions

In 1974, a foundation established a perpetual loan fund at Northeastern University to benefit full-time students enrolled as middle, juniors, and seniors in Boston-Bouvé College of Human Development Professions, the College of Nursing, and the College of Pharmacy and Allied Health Professions. This load fund will aid those students who have a substantial investment in and commitment to the health professions and who require some financial help to complete their preparation.

**Ruth Page Sweet
Scholarship Fund**
Boston-Bouvé College of
Human Development Professions

This fund was established in 1959 by members of the Class of 1919 and alumnae of the Bouvé-Boston School in honor of their classmate, Miss Ruth Page Sweet, Dean of Women in the School from 1929 to 1946, Administrative Director from

1946 to 1948, and Director from 1948 to 1958. The scholarship is presented to a junior or senior who has demonstrated a high level of professional promise indicated by academic record and extracurricular activities.

**A. Gilbert Tenney
Scholarship Fund**

Engineering

This fund is in memory of A. Gilbert Tenney, who served as a captain in the Air Force during the Korean War and was killed while in active service. The income from the fund will be awarded to a needy student or students in the field of electrical engineering studying under the Cooperative Plan of Education.

**The Earl H. Thomson
Memorial Scholarship**

All Colleges

This fund was established in 1971 to honor the memory of Earl H. Thomson, a distinguished alumnus of the Class of 1925. Mr. Thomson became an internationally known trademark attorney as senior partner in the firm of Thomson and Thomson. A member of the Northeastern Corporation since 1958 and a Trustee of the University since 1960, he was also a Director of The National Council, former President of the Northeastern Alumni Association, and a member of the Board of Directors of Nu Epsilon Zeta fraternity.

This scholarship is awarded annually to one or more deserving and needy students enrolled as freshmen and/or upperclassmen who demonstrate a desire to fulfill the limits of their ability in academic and cooperative periods of study. The scholarship is open ended so that additional sums can be added to it in future years and will be administered and awarded by the University without restrictions as to race, creed, geographic origin, or scholastic attainment. It would be Mr. Thomson's desire that scholarship recipients assume a moral obligation to reimburse this or other scholarship funds as they may be able, in order to make additional financial aid available for other students in later years.

**The Eliot F. Tozer
Memorial Scholarship**

Business Administration
and Engineering

This fund was established in 1972 through the generosity of the members of the Class of 1931 in memory of their faculty adviser, Eliot F. Tozer. The scholarship is awarded annually to students of proven need in the middler, junior, or senior classes of the day Colleges of Engineering or Business Administration. The scholarship is open-ended so that additional sums can be added to it in future years. It will be administered and awarded by the University without restrictions as to race, creed, geographic origin, or scholastic attainment.

**Charles Irwin Travelli
Scholarships**

All Colleges

Numerous scholarships have been given yearly since 1950 to students demonstrating financial need, high academic achievement, and an active interest in University life as shown by participation in one or more major activities. Students are named as recipients of Travelli Scholarships at the completion of their sophomore years. Under normal circumstances, these awards will continue through the senior year.

Trustee Scholarships

All Colleges

Established in 1928 by the Board of Trustees of Northeastern University, these full- and partial-tuition scholarships are granted in the Basic Colleges each year to entering freshmen who have demonstrated superior scholastic attainment throughout their preparatory or high school courses.

**Robert E. Turner
Memorial Scholarship Fund**

Business Administration

This scholarship fund was established in 1978 through the generosity of family, friends, and colleagues in memory of Robert E. Turner, a 1952 graduate of North-

eastern's College of Business Administration who was associated with the University for eighteen years. The income from this fund is awarded annually to assist a College of Business Administration undergraduate student majoring in accounting who demonstrates financial need, academic stability, and soundness of character.

Samuel Ulman

Scholarship Fund All Colleges

This fund was established in 1960 by Mrs. Samuel Ulman in memory of Samuel Ulman, a student at Northeastern University from 1912 to 1915. The purpose of the fund is to provide scholarship assistance to students in good academic standing who have financial need.

University Scholarships

All Colleges

Northeastern University has for many years maintained a scholarship fund for deserving qualified students. These scholarships are awarded on the basis of need, scholastic standing, and campus citizenship. The recipient of a Northeastern scholarship must be willing to assume a moral obligation to repay the University at some future date.

Sabestino Volpe

Scholarship Fund

Engineering

The Sabestino Volpe Scholarship Fund was established in 1972 through the generosity of Mr. Sabestino Volpe, a distinguished alumnus of the College of Engineering and a member of the Class of 1928. The income from the fund is awarded annually as a scholarship to an upperclass student enrolled in the day Civil Engineering degree program within the College of Engineering. Recipients must demonstrate financial need, academic stability, and soundness of character.

Henry Ellis Warren

Scholarship Fund

All Colleges

This endowed fund was established in 1981 by the Warren Benevolent Fund, Inc., to honor the memory of Henry Ellis Warren of Ashland, Massachusetts. The income from this fund is awarded annually to undergraduate students who demonstrate financial need, academic stability, and soundness of character. In providing scholarships, preference is given to students from Ashland or contiguous communities.

The Jacob Wasserman

Scholarship Pharmacy

Established in 1966 by his friends in memory of Jacob Wasserman, this fund is to provide scholarship aid to a senior student in the College of Pharmacy and Allied Health Professions. The award will be made annually on the basis of financial need, academic performance, and personal qualities.

Other Scholarships

The following scholarships are funded by outside sources. Traditionally, Northeastern University students have been awarded these funds.

Recommendation for the specific award is made by one of the several college scholarship committees or the departments concerned, in conjunction with the Office of Financial Aid. If you feel you are a potential recipient for any of these awards, notify your financial aid counselor in writing.

Dr. Martin E. Adamo

Scholarship Pharmacy

This scholarship of \$100 is given annually by the Boston Association of Retail Druggists in memory of Dr. Martin E. Adamo, the second president of the New England College of Pharmacy.

**American Foundation for
Pharmaceutical Education
Scholarships** Pharmacy

The Board of Grants of the American Foundation for Pharmaceutical Education provides \$600 to be drawn upon to aid qualified students in the upper three years who are in the upper quarter of their class and who maintain a "B" or higher grade average. It is understood that the students have received or are eligible to receive assistance in an amount at least equal to the grant provided by the Foundation from other University sources in payment of required college expenses. The use of the grant is restricted to the payment of tuition or other required college fees. The recipients are identified as "Scholars of the American Foundation for Pharmaceutical Education."

**The Boston Paper Trades
Association, Inc., Scholarship**
Business Administration

Established in 1966 by the Boston Paper Trades Association, Inc., this is an annual scholarship awarded to a junior or senior who has demonstrated, by cooperative work achievement and extracurricular activities, an interest and potential in the field of sales. The recipient must be of high character, have a good academic record, and be able to demonstrate financial need.

**Boston Society of Civil
Engineers Scholarship
In Memory of
Desmond FitzGerald**
Civil Engineering

In 1931, the Boston Society of Civil Engineers established a scholarship in memory of Desmond FitzGerald, a former president of the Society and eminent hydraulic engineer with a distinguished record of service.

It has been awarded annually since 1931 to an outstanding Northeastern University senior or junior student in the Department of Civil Engineering of the College of Engineering. The presentation is made by the president of the Boston Society of Civil Engineers at the Society's annual meeting in the spring.

**Burroughs Wellcome
Revolving Loan Fund**
Pharmacy

A revolving loan fund was established by the Burroughs Wellcome Pharmacy Education Program to assist deserving pharmacy students in the completion of their education. This fund is established through the assistance of Richard M. Walent, Sheldon Rubin, Fred Matula, Daniel Venuti, and James Harb, members of the National Association of Retail Druggists.

**The William M. Cavanaugh
Memorial Scholarship**
All Colleges

This award, established by the members of the Publicity Club of Boston, is open to men and women of the junior and senior classes who demonstrate talent in the field of communications. The scholarship of \$100 bears the name of the second president of the Publicity Club (1950–1951), who was an able and successful newspaperman.

**Civil Engineering
Department Award**
Civil Engineering

The Civil Engineering Department Award was established by members of that Department to recognize achievement and give financial assistance to a student who has selected a major in the field of Civil Engineering. This award, in the amount of \$100, is financed by gifts from members of the Civil Engineering Department and is awarded to the recipient at the beginning of the sophomore year.

Consumer Value Stores**Scholarship** Pharmacy

Preference will be given to a student entering the senior year who will be seeking a career in community pharmacy practice. Students who are working or have worked for Consumer Value Stores will be given added consideration. The final selection will be made on the basis of demonstrated financial need, personal qualifications, and a sound academic record. Two \$500 scholarships are offered each year.

**Electrical Manufacturers
Representatives Club of New
England, Inc., Scholarship**

Electrical Engineering

Established in 1958, this scholarship of \$475 is granted to a student or students majoring in Electrical Engineering, without regard to race, creed, or color. To qualify, students must have real financial need and excellent scholastic standing.

Frissora Family Scholarship**Award** Engineering

(Science majors)

This award was established by the Frissora family in 1972. Awards are made to freshmen entering Northeastern University, based upon their high school scholastic record and financial need. Preference is given to students of Italian-American extraction who are pursuing an education in a technically oriented curriculum such as engineering, science, mathematics, premedicine, or nursing.

Application for this scholarship award must be made through the Grand Lodge of Massachusetts, Order Sons of Italy in America, 126 Cambridge Street, Boston, Massachusetts. Students selected will receive a grant of \$300 per year for four years. Funds will be paid directly to Northeastern University.

Gilman Brothers, Inc.,**Scholarship** Pharmacy

This scholarship of \$250 is given annually by Gilman Brothers, Inc., to help students further their education in pharmacy.

**Massachusetts State
Pharmaceutical Association**

Scholarship Pharmacy

This scholarship of \$200, established by the Massachusetts State Pharmaceutical Association, is awarded annually. The recipient must be a resident of Massachusetts.

The Massachusetts State Pharmaceutical Association also awards a number of scholarships of \$100. Applications for these scholarships may be secured from the office of the Association at 11 Beacon Street, Boston.

**McKesson and Robbins, Inc.,
Scholarship Award**

Pharmacy

This award of \$200, given annually by McKesson & Robbins, Inc., is awarded to a worthy student who is in financial need. The award recipient is determined by the College of Pharmacy Scholarship Committee and the Office of Financial Aid.

**The New England Paper
Merchants, Inc., Scholarship**

All Colleges

Established in 1959 by the New England Paper Merchants Association, Inc., this is an annual scholarship awarded to a junior or senior who has demonstrated by cooperative work achievement and extracurricular activities an interest and potential in the field of sales. The recipient must be of high character, be able to demonstrate financial need, and have a good academic record.

**Norfolk County Pharmaceutical
Association Scholarship**

Pharmacy

This scholarship of \$50 is awarded annually to a student who meets the requirements both financially and scholastically and is a resident of one of the member towns covered by the Norfolk County Pharmaceutical Association (Norwood, Dedham, Canton, Walpole, Millis, Needham, Westwood, and Islington, in Massachusetts).

**Connecticut Alumni Rudolf O.
Oberg Scholarships**

All Colleges

Each year the Connecticut Alumni Club awards scholarships to students from Connecticut who have achieved a high academic average in their freshman year and have demonstrated financial need. The scholarships are to be used toward the tuition expense of the sophomore year. These scholarships were established in 1958 to promote Northeastern University among the preparatory schools of Connecticut and, in 1971, were named to honor Rudolf O. Oberg, the former Director of Alumni Relations.

The Phi Kappa Phi Scholarship

All Colleges

Established in 1982 by the University's Chapter of Phi Kappa Phi, the national interdisciplinary honor society, the scholarship is available to a student transferring from Roxbury Community College. The nomination is made by the President of Roxbury Community College in accordance with criteria established by the University's chapter.

**South Middlesex
Pharmaceutical Association**

Pharmacy

This tuition scholarship of \$100 established in 1960 is awarded annually to a pharmacy student enrolled in the third, fourth, or fifth year who is in good scholastic standing and in financial need, and living in the area covered by the South Middlesex Pharmaceutical Association (Arlington, Belmont, Lexington, and Watertown, Massachusetts). The recipient will be selected by the Scholarship Committee.

**South Shore Pharmaceutical
Association Scholarship**

Pharmacy

In June of each year, the Scholarship Committee of the Association will select a freshman living in the area covered by the South Shore Pharmaceutical Association (Quincy, Braintree, Weymouth, Hull, Randolph, Hingham, Holbrook, and Cohasset, Massachusetts), who will be awarded a \$100 scholarship to be applied to the tuition of the first semester of the sophomore year.

**Springfield Druggists'
Association Scholarship**

Pharmacy

A scholarship of \$100 is offered by the Springfield Druggists' Association. This is to be awarded to a sophomore or junior who maintains the highest average in the Department of Pharmacy and who is worthy and in need of financial assistance. The Springfield Druggists' Association Scholarship Fund was established in 1956.

Honor Societies and Awards

Honors and Awards

The University encourages the achievement of excellence in scholarship by making monetary awards and chartering honor societies in the various academic disciplines.

Honor Societies

The following honor societies are chartered in the Colleges:

The Academy—in the College of Arts and Sciences

Alpha Kappa Delta—in the College of Arts and Sciences, Department of Sociology and Anthropology

Alpha Phi Sigma—in the College of Criminal Justice

Alpha Pi Mu—in the College of Engineering, Department of Industrial Engineering and Information Systems

Beta Alpha Psi—in the College of Business Administration, Accounting concentration

Beta Gamma Sigma—in the College of Business Administration (Massachusetts Delta Chapter)

Boston-Bouvé College of Human Development Professions Honor Society—in the College, all Departments

Chi Epsilon—in the College of Engineering, Department of Civil Engineering

Delta Phi Alpha—national German honor society

Eta Kappa Nu—in the College of Engineering, Department of Electrical Engineering (Gamma Beta Chapter)

Kappa Delta Pi—in the Boston-Bouvé College of Human Development Professions

Omega Chi Epsilon—in the College of Engineering, Department of Chemical Engineering

Phi Alpha Theta—in the College of Arts and Sciences, Department of History (Northeastern Zeta Tau Chapter)

Phi Kappa Phi—national interdisciplinary honor society

Phi Sigma—in the College of Arts and Sciences, Department of Biology

Phi Sigma Iota—in the College of Arts and Sciences, Romance Languages (Iota Zeta Chapter)

Pi Sigma Alpha—in the College of Arts and Sciences, Department of Political Science (Northeastern Delta Gamma Chapter)

Pi Tau Sigma—in the College of Engineering, Department of Mechanical Engineering (Northeastern Tau Chapter)

Rho Chi Society—in the College of Pharmacy and Allied Health Professions (Beta Tau Chapter)

Sigma Epsilon Rho—in University College

Sigma Theta Tau—in the College of Nursing

Sigma Xi—Scientific Research Society of North America

Tau Alpha Pi—in Lincoln College (national engineering technology honor society)

Tau Beta Pi—in the College of Engineering (Massachusetts Epsilon Chapter)

Election to the college honor societies is based primarily upon scholarship, but, before a man or woman is privileged to wear the honor society insignia, there must be evidence of an integrity of character and an interest in the extracurricular life of the University. The societies have memberships consisting of the outstanding men and women in the colleges. Election to an honor society is the highest honor that can be conferred upon an undergraduate.

Awards for Upperclassmen

University awards are determined by scholastic and citizenship achievement. They are presented by appropriate committees headed by the Dean of Students.

The Academy Award

Arts and Sciences

The Academy, the honor society of the College of Arts and Sciences, offers an annual award of \$100 to the sophomore in the College of Arts and Sciences who, during the previous year as a freshman, achieved the highest scholastic record.

William Jefferson Alcott, Jr., Award All Colleges

This award of \$200 was established in 1934 by members of the faculty and other friends to perpetuate the memory of William Jefferson Alcott, Jr., a brilliant member of the Northeastern Department of Mathematics from 1924 until his death in 1933. The annual award to a senior is made from the income of the fund "for outstanding performance, either in the way of unusual excellence in routine work or in connection with some intellectual activity outside or beyond the requirements of the curriculum."

Alumni Awards for Professional Promise

All Colleges

Established in 1947 by the Alumni Association, these awards are presented annually at an Alumni Association meeting in the spring of the year. The awards are made to the outstanding seniors in each of the Basic Colleges and in University and Lincoln Colleges who have demonstrated unusual professional promise through their character traits, scholastic achievement, and cooperative work performance.

The Beta Gamma Sigma Society Award

Business Administration

"The purpose of this society shall be to encourage and reward scholarship and accomplishment among students of business administration, to promote the advancement of education in the art and science of business, and to foster integrity in the conduct of business operators."

Election to membership in Beta Gamma Sigma is the highest scholastic honor open to a student in business administration.

The Massachusetts Delta Chapter of Beta Gamma Sigma, the national honor society of colleges of business administration, offers an annual scholarship of \$100 to the sophomore in the College of Business Administration who, during the previous year as a freshman, achieved the highest scholastic record.

Boston-Bouvé College of Human Development Professions Honor Society Awards

Boston-Bouvé College of
Human Development Professions

The Society offers an annual award of \$100 to the sophomore in Boston-Bouvé College of Human Development Professions who, during the previous year as a freshman in the College, achieved the highest scholastic record. Each student voted into the Society receives an engraved certificate at a special Honors Assembly.

Cooperative Education Awards All Colleges

These awards are presented to seniors in the Basic Colleges in recognition of outstanding performance in the Cooperative Education Program, through which they have personified the objectives and ideals of the University. The awards are presented at the Annual Awards Luncheon.

Sears B. Condit**Honor Awards**

All Colleges

These awards were established in 1940 through the generosity of Sears B. Condit. On Honors Day, Sears B. Condit Honor Awards are presented annually to outstanding students in the senior class. Each award carries a stipend as well as a certificate of achievement.

Joseph Arthur Coolidge**Achievement Awards**

Physical Sciences

Established in 1977 with funds provided by the will of Joseph A. Coolidge, a distinguished member of the Northeastern University faculty from 1911 to 1954 and Chairman of the Department of Physics from 1912 to 1935, three awards of \$500 each are granted annually to the outstanding sophomore, middler, and junior physical sciences students. These awards are based primarily on distinguished academic achievement, with additional consideration given to soundness of character, participation in extracurricular activities on and off campus, and qualities of leadership. Preference will be given to students majoring in physics, mathematics, or other physical sciences.

Richard Cardinal Cushing**Scholarship**

All Colleges

The Richard Cardinal Cushing Scholarship was established in 1978 through the generosity of the Massachusetts Committee of Catholics, Protestants, and Jews. The income from the scholarship's endowment will be awarded annually to a Catholic, a Protestant, and a Jewish student who embody the principles of brotherhood and justice and who, through their work on campus, have become positive forces for religious understanding.

Director's Award

The Director's Award of \$100 is made annually by the Director of the African-American Institute to the individual judged by the Director to be the most outstanding black senior. The award is based on involvement in African-American Institute programs and scholarship, as well as interaction with the community at large. The award is presented at the Awards and Unity Banquet in June.

Alfred J. Ferretti Award

Engineering

Tau Kappa Chapter of Pi Tau Sigma, the Mechanical Engineering national honor fraternity, sponsors an annual award to the sophomore mechanical engineering student at Northeastern having the highest scholastic standing. The award is named in honor of Professor Ferretti, who retired June 30, 1961, after forty-three years of service to the University.

Alfred J. and Laura M. Ferretti**Scholarship**

Engineering

This scholarship was established in 1978 by Professor Alfred J. Ferretti, who retired in 1961 after forty-three years of service to Northeastern University. It honors the memory of Mrs. Ferretti and is to benefit worthy undergraduate students who are majoring in Mechanical Engineering. Recipients should demonstrate high academic achievement by maintaining a minimum average of 3.0 and should be of sound character.

Luis de Flores**Endowment Fund**

All Colleges

This fund was established in 1964 to provide yearly awards to students in recognition of superior ingenuity, irrespective of general academic standing.

Clara and Joseph F. Ford**Awards**

All Colleges

The Ford Awards are made to students who have shown a democratic and tolerant spirit and who are well disposed toward people of all creeds and races. They are

chosen from the senior class and judged on the basis of their contributions through participation or leadership and their extracurricular organizations. Students must have demonstrated by their actions that they are particularly tolerant and willing to work with and for other people.

**The Harold D. Hodgkinson
Achievement Awards**

All Colleges

Established in 1954, the Harold D. Hodgkinson Achievement Awards of at least \$750 each are granted annually to a senior student in Division A and Division B. The winners of the awards are known as the Hodgkinson Scholars for the year in which they are chosen.

The award is based primarily upon distinguished scholastic achievement with due consideration of character, personality, qualities of leadership, cooperative work experience, military record (if any), and service in voluntary organizations and activities. Student leadership accomplishments and professional potential are evaluated in connection with these criteria.

The Hodgkinson Scholars are chosen by a committee of administrative members of the faculty. An appropriate certificate is presented to each recipient as a permanent record of his/her selection.

Kappa Delta Pi Award

Boston-Bouvé College of

Human Development Professions

Kappa Delta Phi honor society offers an annual award of \$100 to the sophomore who, during the freshman year, achieved the highest scholastic record.

**Robert D. Klein Memorial
Scholarship**

Arts and Sciences

This scholarship was established in 1981 through the generosity of family, friends, and colleagues of Professor Klein, who joined the Northeastern University faculty in 1957, served as acting chairman of the Department of Mathematics between 1969 and 1970 and, from 1977 until his death in 1978, was a professor of mathematics. The scholarship is awarded annually to a freshman student enrolled in the College of Arts and Sciences who demonstrates consistent effort and academic achievement in remedial mathematics, the educational program to which Professor Klein contributed so significantly.

The Lilly Achievement Award

Pharmacy

The Lilly Achievement Award is given to a graduating senior for superior scholastic and professional achievement. Leadership qualities, professional attitudes, and academic performance will be considered in the selection of the individual for this award.

**Julia and Merrill Robert
Lovinger Award**

All Colleges

This annual \$100 award was established in 1960 by William Lovinger for the purpose of giving assistance to a student of acceptable scholastic standing who can demonstrate financial need.

Robert Lubets Award

Business Administration

The award was established in 1953 by the Boston accounting firm of Robert Lubets & Company to recognize outstanding professional development and personal growth by students training for careers in accounting. Two hundred dollars will be awarded to a degree candidate who, at the completion of the junior year, has demonstrated the greatest personal growth and professional development as evidenced by improvement in scholastic achievement accompanied by professional aptitude indicative of future success as an accountant.

**McKesson & Robbins, Inc.,
Scholarship
Pharmacy**

This scholarship of \$200, given annually by McKesson & Robbins, Inc., is awarded to a worthy student in financial need.

**Susan L. Orchard
Memorial Fund
All Colleges**

In 1978, the Susan L. Orchard Memorial Fund was established at Northeastern in memory of Susan L. Orchard, a former University student. Reflecting Susan's interest in improving the quality of life and opportunities for women, the annual income of this fund will be awarded to mothers pursuing their studies at Northeastern who require financial assistance in order for their children to make use of the University's Day Care Center. Recipients will be selected by the Center's Director and Advisory Committee.

**Ruth E. Phalen Memorial
Award Fund
All Colleges**

This fund was established in 1959 by Thomas E. Phalen, Jr., a member of the faculty, in memory of his wife. The income from this fund is used yearly as a cash award to a senior, junior, or middler, preferably in the College of Engineering, who maintains at least a 2.0 academic average, shows outstanding ability in one or more varsity sports, and demonstrates excellent campus citizenship.

**The Phi Sigma Society Award
Arts and Sciences**

Phi Sigma, honor society in the Department of Biology, offers an annual award of \$50 to the junior or senior majoring in biology or a related science who demonstrates the greatest research potential. To qualify for the award, the student must be a member of Phi Sigma.

**Roland Guyer Porter
Memorial Fund
Electrical Engineering**

This fund was established in 1953 by colleagues and friends of the late Professor Roland G. Porter, for many years the head of the Department of Electrical Engineering. Interest from the fund provides an annual award to a student in the Department of Electrical Engineering who best exemplifies the qualities of mind and character that Professor Porter did so much to develop in his lifetime.

**President's Awards
All Colleges**

On the annual Honors Day, six awards of \$200 each, known as the President's Awards, are presented to the students with the highest records in both divisions of the sophomore, middler, and junior classes.

**The William Rand Award
Engineering**

The Massachusetts Epsilon Chapter of Tau Beta Pi annually offers an award to the outstanding middler in the College of Engineering. The award is based upon outstanding scholarship, breadth of interest, and contribution to the University. All middleers with a 3.5 average or above are eligible; the winner is chosen after careful screening and interviews with members of the chapter.

**The Mildred A. Reardon
Scholarship Award
All Colleges**

Delta Pi Alpha Sorority sponsors an annual award of \$100 to a deserving female student in the Basic Colleges. Selection is made by the Dean of Students on the basis of academic standing and other considerations. The award is given in honor of an outstanding alumna of Northeastern and Delta Pi Alpha, whose academic excellence, strength of character, and qualities of leadership have typified the ideal for which the sorority strives.

ROTC Awards

ROTC

Awards totaling \$1,000 are available to ROTC cadets each year. The University offers ten \$50 awards annually—four to sophomores, four to middlers, and two to juniors.

Scabbard and Blade (the cadet officers' honor society) offers one award annually to middlers. The Pershing Rifles (the basic-course honor society) offers a \$50 award to a sophomore Pershing Rifles cadet.

Academic Achievement Awards are won by each cadet in the top 10 percent of ROTC classes. This award, a wreath, is worn above the right breast pocket of the uniform during the year immediately following the year it is earned. Leadership Achievement Awards, consisting of letters of commendation, are awarded to each cadet in the top 10 percent in leadership potential.

Many medals and trophies are also awarded by other organizations to ROTC cadets for achievements in diverse fields.

Nguzo Saba Award

Two Nguzo Saba Awards are presented each year by the African-American Institute to the black male and female who have proved themselves of invaluable service to the black community of Northeastern University and Boston. The award is in the amount of \$100 and is presented at the Awards and Unity Banquet.

Sigma Theta

Nursing

Sigma Theta, the honor society in the College of Nursing, annually offers an award of \$100 to the sophomore in the College of Nursing who, during the previous year as a freshman, achieved the highest scholastic record.

Professor Joseph Spear Fund for Excellence in Student Activities

This fund was established by the College of Engineering Class of 1923 in recognition of Professor Spear, class adviser and mentor. It was through Professor Spear's devotion and concern for the well-being of the students that he developed and promoted student activities at Northeastern University. Professor Spear has been referred to as the "Father of Student Activities." The purpose of this fund is to provide a source of income that can be awarded annually to juniors and seniors who have made outstanding contributions to student activities.

Max Starr Award

Business Administration

The Max Starr Award in Public Accounting was established in 1968 by the Max Starr Foundation to recognize every other year an outstanding member of the junior class in the College of Business Administration preparing for a career in public accounting. The recipient is chosen on the basis of both academic and cooperative work records as well as personal qualities. The student receives awards of \$250 in both the junior and senior years.

The Dr. Ruth E. Sullivan Memorial Scholarship Fund

Arts and Sciences

This fund was established at Northeastern University in 1976 through the generosity of family, friends, and colleagues of Dr. Sullivan, who was a member of the Department of English from 1968 until her death in 1976. One scholarship is awarded annually to an undergraduate senior who demonstrates academic achievement and excellence in interdisciplinary studies in the liberal arts, such as literature and psychology, the fields to which Dr. Sullivan contributed so significantly.

Tau Beta Pi Award

Engineering

Massachusetts Epsilon Chapter of Tau Beta Pi Association, national honor society in engineering, annually offers a scholarship of \$100 to the sophomore in the College of Engineering who, during the previous year as a freshman, made the highest scholastic record.

Housing

Residence Halls

Northeastern University's location, in one of the most central and exciting sections of Boston, offers the student an opportunity to participate in many cultural and educational activities. With residence halls on the Back Bay campus, between the Museum of Fine Arts and Symphony Hall, the city is at your doorstep. Northeastern's library, student center, and athletic facilities are nearby.

Most of the residence halls have lounge areas and recreation rooms, including color television. Privacy and a quiet study environment are encouraged, but students must recognize that residence hall living cannot provide the privacy and quiet they may enjoy in their own homes. However, the benefits, as well as the occasional inconveniences of living in a community, may contribute to personal growth.

A natural advantage of residence living may be the increased involvement in social and educational activities. Students are encouraged to join the committees that make decisions about student life.

Full- or part-time residence hall staff reside in each residence facility.

Housing Application and Contract

Students requesting University housing on their application for admission will receive two housing applications with their certificate of acceptance: one for their files and one to be returned with the required \$100 housing deposit to the Office of the Bursar, 245 Richards Hall. Assignments, which are made on a first-come, first-served basis, are mailed after receipt of payment of an additional \$400 room-assignment deposit.

A housing contract will be distributed after the application and deposits are received by the established deadline. The freshman contract is for three full quarters; upperclass transfer students must file applications on a quarterly basis as their contract is valid for only one quarter at a time. Contracts for summer-quarter freshmen are handled on an individual basis in accordance with the student's academic schedule.

Married and Graduate Housing

No University housing is available for married or graduate students. However, the University does maintain listings of off-campus rooms and apartments. These are available at the Housing Office, 104-106 Ell Building. **Though the Housing Office has agreed to make this listing available, we do not inspect or endorse the advertised property or space.**

The Selection

The choice of housing is an important consideration for the first year, and freshmen are encouraged to visit Northeastern before making a decision. Tours of residence halls are available by advance arrangement with the Department of Admissions.

Upperclass and transfer students may live in residence halls or apartments. Freshmen are usually assigned to residence halls unless available space exists only in apartments.

Most rooms are designed to accommodate two students; however, some three- and four-person rooms are available in certain of these facilities. Some residence halls feature "group areas" that house from three to six students in a two- or three-room area.

The University maintains some apartment units for men and women. These apartments accommodate up to four students. Assignments are made, based on the date of receipt of the housing deposit and application. Each unit is fully furnished, and the rental charge includes utilities.

Off-Campus Housing

Arrangements for off-campus housing are the responsibility of the student and the student's family. Though the Housing Office, 104–106 Ell, has agreed to make a listing of off-campus housing available, **we do not inspect or endorse the advertised property or space.**

Fraternity Housing

Certain fraternities provide opportunities for room and board for men at reasonable rates. Information regarding these housing facilities may be obtained from the Housing Office, 104–106 Ell, Northeastern University, Boston, Massachusetts 02115.

Cars

Freshmen living in residence halls are not allowed to have cars or other powered vehicles on campus.

Upperclass students are strongly discouraged from bringing cars with them, as the University does not permit overnight parking, and there is a severe shortage of public parking spaces near the University.

Costs for Room and Board Per Quarter*

<i>Women's Residence Halls</i>	
Kerr Hall (upperclass students only)	\$1100.00
157–163 Hemenway	\$1200.00
<i>Coed Residence Halls</i>	
Smith Hall (upperclass students only)	\$1100.00
Speare Hall	\$1200.00
Stetson Hall West	\$1200.00
Stetson Hall East	\$1200.00
White Hall	\$1100.00
YMCA (includes cost of single room)	\$1125.00
153 Hemenway Street	\$1200.00
115 Hemenway Street	\$1200.00
119 Hemenway Street	\$1200.00
<i>Men's Residence Halls</i>	
Melvin Hall	\$1100.00
Light Hall	\$1100.00
<i>Apartments (Costs do not include Food Card)</i>	
106–122 St. Stephen Street	\$710.00
Fairwood Realty—Huntington Avenue	\$650.00
Scott Mgt.—454 Huntington Avenue, 204–407 Huntington Avenue	\$650.00
Rubenstein Hall—464 Huntington Avenue	\$710.00
West Apartments—50 Leon Street	\$765.00

With the exception of the YMCA, all single rooms are charged at an additional rate of \$50. An infirmary fee of \$25 per quarter is charged to resident students.

***Costs and types of residence halls (coed, men, women) are subject to change.**

Security

Security for the residence halls is provided by trained University police officers. In addition, residents are required to show appropriate identification to the security proctor when entering the residence hall. Guests, both male and female, must sign in with the proctor.

The University police provide escort service for students who wish to go from one section of the campus to another late at night.

University Food Service

The University food plan provides for twenty-one meals per week, and all students who live in University residence halls **are required to participate**. The cost of a food card for those living in an apartment and choosing the food plan is \$550 per quarter. When conditions warrant, such as during weekends and slow periods, the University may close or consolidate certain dining facilities.

Student Activities

The University regards student activities as an integral part of education and provides for a range of activities to arouse your interests and satisfy your inclinations: you are given the opportunity to play intramural sports on a wide variety of teams; write for the *Northeastern News*; broadcast over the student-operated radio station; act, dance, sing, play music; or become involved with student government.

The University encourages relaxation and socializing: you can dance to live music in the Rathskeller any evening or weekend and meet a lot of new friends. We sponsor a lecture series, films, and performing arts: listen to speakers such as Tom Wicker, Jesse Jackson, or Tom Wolfe. See great new and old films for a dollar in Alumni Auditorium, hear jazz and classical groups, and watch theater, dance, and virtuoso performances. Once you begin to take advantage of what is available on campus, there's no telling what you will learn or whom you might meet.



If you are a commuter student, it is likely that a good portion of your between-class time will be spend in the Carl. S. Ell Student Center. The dominant feature of the main level of this "student building" is the magnificent main lounge. Five stories in height, the lounge will comfortably seat 800 students—a good place for quiet conversation or contemplation. Below the lounge are a cafeteria and the Rathskeller, where the sounds are much more audible. In addition, the Center has a ballroom, sidewalk cafe, music practice rooms, a large gameroom with pool and ping-pong tables, and many meeting and function rooms. The Student Center is that part of Northeastern University where you can relax and really feel comfortable and at home—a sort of "living room" of the campus.

Each Monday and Thursday, the hours between 11:30 a.m. and 1:30 p.m. are reserved for student activities. No classes are held during these times, to allow students an uninterrupted period of time for themselves. Student clubs, intramural sports, cultural events, and many other activities are scheduled to provide opportunities to make spontaneous or planned use of your time. You have the chance to become involved in campus activities, whether you reside in the residence halls or are a commuter, without interfering with your academic commitments.

Student Organizations

All-University Activities

NU Freshman Orientation Staff

Programming Organizations

Council of Alternative Programs

Rathskeller Committee

Social Council

Concert Committee

Film Committee

Lecture Committee

Publicity Committee

Special Events Committee

Student Alumni Association

Student Government Association

Student Affairs Committee

Student Center Committee

Student Court

Student Union

Unicom

Artistic and Musical Organizations

Band

Choral Society

Dance Theatre

Early Music Players

Jazz Society

Modern Dance Club

Orchestra

Silver Masque

Departmental and Academic Organizations

Accounting Society

American Society of Personnel Administrators

Association for Computing Machinery

Beta Biological Society

Black Business Student Association

Black Engineering Student Society

Business Student Advisory Committee
Co-op Student Advisory Committee
Criminal Justice Advisory Council
Criminal Justice Student Security Organization
Economics Club
English Club
Evening Student Council
Financial Management Association
History Club
Human Resource Management Club
Human Services Student Organization
International Business Association
Marketing Club
MBA Women of Northeastern
Medical Laboratory Science Club
Physical Education Majors Club
Physical Therapy Yearbook
Physics Club
Political Science Student Advisory Committee
Recreation Majors Club
Respiratory Therapy Club
Society for the Advancement of Communication Studies
Sociology/Anthropology Students Association
Speech and Hearing Club
Student-Faculty Biology Relations Committee
Student Health Records Association
Student Industrial Security Association
Student Nurses Association
Toxicology Student Association

Political and Social Action Organizations

Committee in Solidarity with the People of El Salvador
Pro-Choice
Students for Safe Energy
Young Democrats
Young Republicans

Media

Cauldron
Northeastern News
Onyx
Spectrum
WRBB-FM

Special Interest Clubs

Amateur Radio Club
Association of the U.S. Army
Cheerleaders
Downhill Skiers
Dragon Karate Club
Flying Club
Groove Phi Groove Social Fellowship
Hus-Skiers and Outing Club (NUHOC)
Juggling Club
Karate Club
Lambda: Gay Students Organization

Model Railroad Club
Pershing Rifles
Photography Club
Sailing Club
Scabbard and Blade
Semper Fidelis (Marines) Club
Shotokan Karate Club
Sport Parachute Club
Tactical Society
Terra Society
Underwater Society
Women's Center

Religious Organizations

Bahai'
Chi Alpha Christian Fellowship
Christian Fellowship
Christian Science Organization
Christian Student Association
Fellowship of Christian Athletes
Hillel
Islamic Society
Maranatha Ministries
Navigators
Phanar Orthodox Society
Seekers Christian Fellowship

Ethnic and Cultural Clubs

Arab Heritage Cultural Club
Armenian Club
Chinese Student Club
Confederation of Iranian Students
Federation of Nigerian Students
Haitian Student Unity
Hellenic Club
International Students Forum
Iranian Student Organization
Irish Club
Latin-American Student Union
National Black Student Association
Organization of Arabic Students
Persian Student Society

New Horizons

This program, sponsored by the Student Activities Department, is designed to provide enjoyment as well as the opportunity to engage in a unique learning experience.

The series of free, noncredit mini-courses is conducted by qualified persons in special areas of interest. There are no grades, no transcripts, and no examinations. In a few courses, textbooks are required; in areas such as the performing arts, contemporary issues, crafts, or media, a material fee may be required.

Enrollment in courses is determined on a priority basis with first opportunities for registration to full-time undergraduate and graduate students, and on a space-available basis on the last day of registration to other members of the Northeastern community.

Course enrollment is limited by the nature of the subject matter and the size of the facility. Registration is on a first-come, first-served basis.

For questions, brochures, or applications to teach a free mini-course, call or write the Office of Student Activities, Room 255 Ell Center; telephone: 617-437-2634.

Fraternities

The thirteen recognized fraternities and one colony play an important role in the extracurricular life of the University. A list of fraternities and their addresses are as follows:

Alpha Epsilon Pi 255 Ell Center 360 Huntington Ave. Boston, MA 02115	Nu Epsilon Zeta 255 St. Paul St. Brookline, MA 02146 566-9804
Alpha Kappa Sigma 30 Greenough Ave. Jamaica Plain, MA 02130 524-9869	Phi Beta Alpha 6 Cerina Rd. Jamaica Plain, MA 02130 524-9668
Beta Gamma Epsilon 234 Commonwealth Ave. Boston, MA 02116 262-1639	Phi Beta Sigma (Colony) 255 Ell Center 360 Huntington Ave. Boston, MA 02115
Delta Chi 430 Centre St. Jamaica Plain, MA 02130	Phi Gamma Pi 241 Kent St. Brookline, MA 02146 566-8970
Iota Phi Theta 255 Ell Center 360 Huntington Ave. Boston, MA 02115	Phi Sigma Kappa 37 Greenough Ave. Jamaica Plain, MA 02130 524-9893
Gamma Phi Kappa 11 Vancouver St. Boston, MA 02115 427-8774	Tau Kappa Epsilon 255 Ell Center 360 Huntington Ave. Boston, MA 02115
Kappa Alpha Psi 255 Ell Center 360 Huntington Ave. Boston, MA 02115	Zeta Beta Tau 42 Chestnut Square Jamaica Plain, MA 02130 522-5162

Sororities

The two recognized sororities and three colonies for women also play an important role in the extracurricular life of the University. Although none has a separate house, they can all be reached through the Office of Student Activities, Room 255 EC, or the Intersorority Council adviser in the Dean of Students' Office, 203 EL, at the University. The names of the sororities follow:

Alpha Kappa Alpha
Delta Phi Epsilon
Delta Sigma Theta
Sigma Delta Epsilon
Zeta Phi Beta

Sports

The University provides opportunities for all students to participate in athletic programs that correspond to the abilities and inclinations of most students. We especially wish to provide each of you with a chance to develop skills and competence for lifelong athletic pursuits. Along with many casual, drop-in opportunities are chances for all to participate as members of intramural teams. Examples of intramural sports include touch football, basketball, volleyball, soccer, ice hockey, wrestling, softball, and track.

Professional Societies

Students will benefit in many ways by joining the student chapter of a professional society in an area of study of particular interest to them. They have the opportunity to keep up with latest developments by listening to authorities in that field, to exchange ideas with students from other colleges and universities as well as from Northeastern, and to learn more about professional standards.

If students take an active part by attending regular meetings and social affairs, they may become officers or members of a delegation to meetings outside the University. Such participation may prove invaluable in shaping a career.

The following professional societies, the majority of which are national organizations, are open to upperclassmen in their respective professional fields:

American Chemical Society
American Institute of Chemical Engineers
American Institute of Industrial Engineers
American Society of Civil Engineers
American Society of Mechanical Engineers
Engineers Council
Institute of Electrical and Electronic Engineers
National Student Nurses Association
Sigma Delta Chi (Journalism)
Society of Women Engineers
Society of Women in Business
Student American Pharmaceutical Association

Photo-Identification Operation

All full-time students, staff, and faculty are required to have an officially approved and properly validated photo-identification card. All students are required to show the card at the Library, athletic events, student elections, Health Services, and the Bursar's or Registrar's Office.

An official I.D. card will be issued to new students at their orientation and registration periods. Replacements for lost cards can be obtained by going FIRST to the Bursar's Office, 248 RI, and then, for the photo, to 255 EC between the hours 11:30 a.m.–2:30 p.m., Monday through Friday. A charge of \$2 is levied for the initial I.D. card; \$5 for a replacement.

Religious Life

Northeastern has genuine concern for the religious and moral development of students of all faiths. A Religious Advisory Board, consisting of administrators and faculty, as well as the full-time guest chaplains, seeks

to articulate the needs in this area and facilitate the work of various religious groups on campus. A Chaplains' Association, consisting of the full-time guest chaplains, works cooperatively to emphasize the interfaith dimensions of campus life.

The chaplains also deal with students on a denominational basis at various centers near the campus: Episcopal College Work Center in Brookline; Hillel House on Parker Street; Lutheran Center, 84 The Fenway; and St. Ann's Roman Catholic Parish on St. Stephen Street. In addition, there are numerous religious student organizations on campus, recognized by the Student Affairs Committee and listed under "Student Organizations."

Interfaith chapel services are held in the Bacon Memorial Chapel, located in the Eli Student Center. These voluntary religious services are planned to commemorate special days and events and will be announced sufficiently ahead of time. The Chapel is also used for denominational worship services and special lectures on religion. It is open daily for prayer and meditation and is a frequent setting for weddings of students and alumni.

Men's Athletics

Whether it be on the superturf of Parsons Field in the fall, the ice or hardwood of the Northeastern Arena in the winter, or the waters of the picturesque Charles River in the spring, a Northeastern athletic team is always competing somewhere.

And that somewhere is also, at times, Henley on the Thames, England; San Diego; Madison Square Garden, New York; and Fenway Park, Boston. In fact, you could include Montreal in the summer of '76 when three Northeastern alumni (more than any other New England college) were members of the United States Olympic team, with one alumnus winning a silver medal.

All students are urged to participate in the University's athletic program, which includes all major collegiate sports. The University maintains varsity teams in baseball, crew, swimming, cross-country, track, football, hockey, basketball, and golf. These teams are among the finest in the East and have represented the University in both national and international competition. Students may also participate in such sports as sailing, water polo, volleyball, lacrosse, soccer, gymnastics, softball, handball, and fencing.

Facilities include the spacious Cabot Physical Education Center, Edward S. Parsons Field, and the refurbished Northeastern Arena. The Cabot Gymnasium contains four basketball courts, one gymnastics court, and a cage for indoor track as well as baseball and football drills. Parsons Field is the location of the Huskies' football stadium, with its new artificial surface, and of the Northeastern baseball diamond. It also accommodates training areas for the outdoor track team. The Northeastern crew enjoys a spacious boathouse on the Charles River and also works out in the Cabot complex, where rowing tanks are located.

The hockey and basketball teams make their homes in the historic "Boston Arena," now the Northeastern Arena since its purchase by the University in 1979. The Arena is located just a slapshot away from the main quadrangle of the campus and, in addition to ice, of course, offers the Husky hoopsters a portable floor on which to play.

The oldest indoor hockey rink in the world, the Northeastern Arena features a seating capacity of some 7,000 and the finest sight lines of any

arena in the nation. This past winter, the Northeastern Arena served as a veritable turnstile of thrills, as the hockey and basketball teams traded turns establishing milestones on their respective surfaces.

With record crowds jamming the sparkling facility, the hockey team responded with a historic twenty-five-win season that included, among many precedents, an ECAC Championship and a third place in the NCAA Tournament.

When the ice was hidden under the portable floor, the basketball team obliged with a brilliant 23–7 season, a second-straight ECAC North title that it defended at the Arena, and a second-straight trip to the NCAA tournament field, in which the hoop Huskies advanced to the second round.

Northeastern annually fields one of the most competitive football teams in New England, as a Division IAA independent. In their forty-six-year history of football, the Huskies have enjoyed three undefeated seasons and, in 1963, went to play in the Eastern Bowl. Northeastern always plays a demanding schedule, including in recent years such opponents as Harvard, Holy Cross, Colgate, UMass, Lehigh, New Hampshire, and Rhode Island.

The University's hockey team traditionally is one of the strongest in the East. It is ranked annually in the top ten in the East and has competed in several Eastern College Athletic Conference Championships. The Husky icemen have won the ECAC Holiday Hockey Tournament in Madison Square Garden, the RPI Invitational, and the Yale Holiday Festival. Each February, Northeastern plays in the prestigious Beanpot Tournament before standing-room-only crowds at the Boston Garden. In fact, the team won the annual battle of the Boston colleges (Harvard, Boston College, and Boston University) in 1979–80, making NU the first New England college to win both the men's and women's Beanpots in the same year.

The basketball team wages its roundball wars in the tough, Division I ECAC North conference of the NCAA. It plays local powers such as Boston College, Holy Cross, and Boston University and is constantly flying out to challenge some of the nation's best, including Princeton, Georgia, Southern Mississippi, University of Pennsylvania, and Syracuse. Even against the best in the East, Northeastern has sixteen winning seasons in the last twenty years and for the last two years earned a berth in the NCAA Championships as the ECAC North Champion.

To talk about track and cross country in New England is to talk about Northeastern track. Northeastern has dominated the New England track and field scene for the past ten years. In that stretch, Northeastern has captured six New England indoor titles and NCAA Championships and has many alumni running for national and international honors as members of top track clubs.

Northeastern also fields a strong team in golf and competes in all the major eastern championships.

The most amazing Husky sports story is that of crew. In 1965, its first season, the NU crew won four of five regattas and the small college rowing championships and became the first NU team to participate in international competition when it rowed in the Henley Royal Regatta. The next year, the Huskies moved into the major college rowing league. They culminated their swift rise by winning the Eastern Sprints in 1972 and 1973 and rowed in the finals of the Grand Challenge Cup of the Henley Royal Regatta. In 1973, they were considered the finest eight in the nation. In 1978, the freshman crew won the Eastern Sprints and was invited to row the Thames Challenge Cup race at Henley. In 1979, the junior varsity crew won the I.R.A. Championship.

The University has buttressed its physical fitness facilities campus-wide and now accommodates the daily influx of undergraduates, graduate students, staff, and faculty at Cabot Gymnasium and the Northeastern Arena. One of the most popular accoutrements in the Cabot Gymnasium is the three-year-old Nautilus weight-training room, equipped with revolutionary Nautilus apparatus and traditional free weights. Six racquetball courts are also available to students, athletes, faculty, or staff members. Daily ice time is set aside at the Northeastern Arena for the University community and the public, as well.

Women's Athletics

From a very small program with very few resources, the Northeastern University women's intercollegiate athletic program has grown rapidly in the past several years, reflecting the tremendous growth in women's athletics at all levels. The program now encompasses eleven activities: basketball, crew, cross-country, field hockey, gymnastics, ice hockey, lacrosse, swimming and diving, tennis, track and field, and volleyball.

As charter members of the Association for Intercollegiate Athletics for Women, Northeastern University subscribes to all policies and regulations of the Association. Athletic scholarships are available to women student athletes in all programs.

Northeastern's goal is to provide an excellent program of intercollegiate athletics for all women students who qualify. Our programs are in the mainstream of the exciting growth in women's athletics throughout the country.

This year, the basketball team defeated eastern power Providence College en route to the EAIAW regional playoffs.

The field hockey and lacrosse teams, using the astroturf at Edward S. Parson's Field in Brookline as their home field, have long been regarded as among the strongest in New England. Our basketball and volleyball programs, working out of Dockser Hall and Cabot Gymnasium on the Boston campus, have appeared in state and regional championships. The tennis team, with recent steady improvement, is well respected in the region. Our gymnastics team, with a vastly upgraded schedule, is striving to reach a high level of regionally competitive scoring.

Two of our younger programs—crew and swimming and diving—have shown rapid improvement. Several swimmers and divers have qualified for national championship for the past several years, and members of our crew have been selected for participation in Olympic Development Camps and have been gold medal winners at the National Sports Festival.

Our three newest teams—cross country, ice hockey, and track and field—are entering their second year with varsity status. The ice hockey team, which makes its home in the beautifully renovated Northeastern Arena, is rapidly becoming one of the strongest teams in the East, while our track and field continues its development.

We are moving toward excellence in all programs and, as usual, look forward to an exciting year.

Freshman Orientation Programs

Except for the visits which we hope students will make to the Admissions Office, the first opportunity to learn about Northeastern and to meet classmates, deans, and advisers will come during the freshman orientation period.

The program for orientation is planned and supervised by the Director of Orientation who will see to it that students are introduced to the customs and people that make up Northeastern. At that time, registration, class schedules, and other procedures and details necessary for enrollment will be completed.

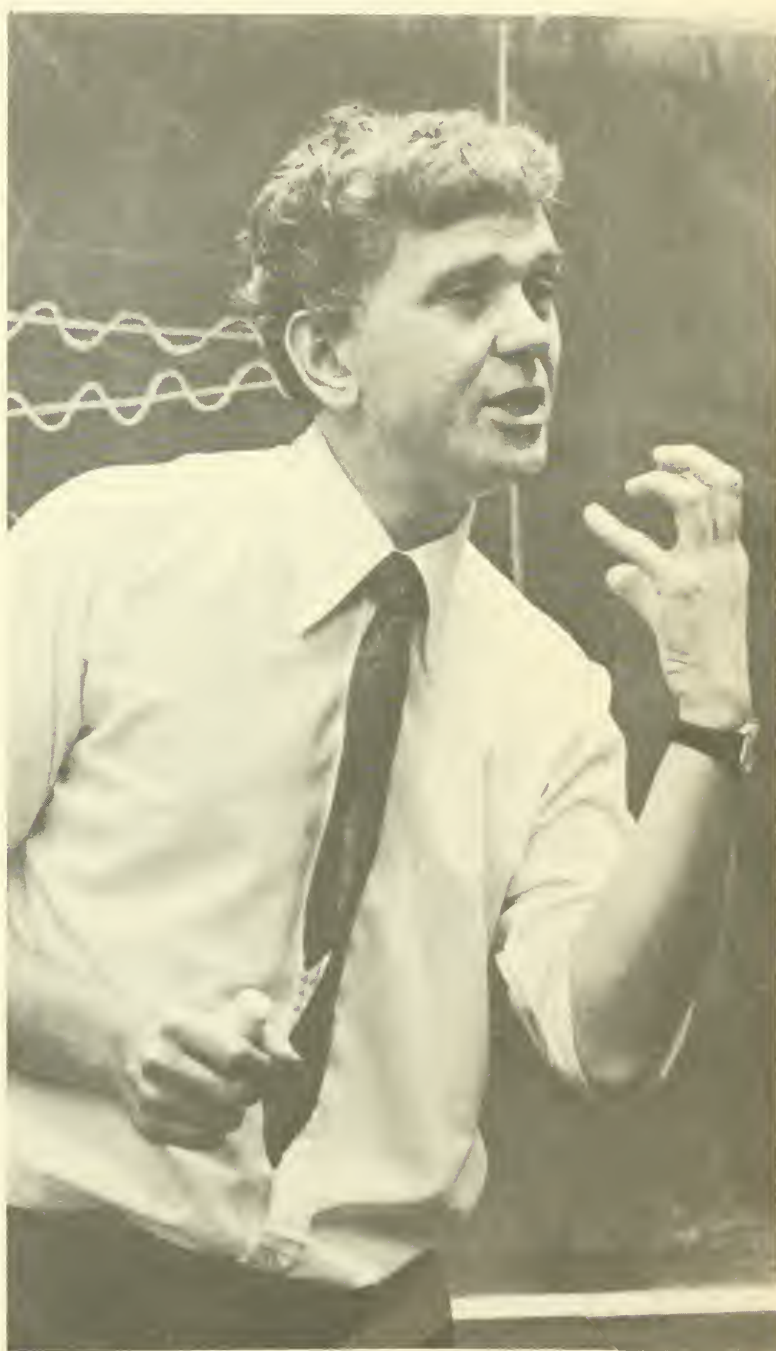
During the orientation period, in accordance with a long-standing tradition, students will be welcomed by the President at a special convocation. They also will be able to meet with deans and others who will have important roles in their college careers.

Upperclass students generously volunteer their time to assist in setting up and running programs, primarily evening events, that provide opportunities for relaxation, recreation, and cultural enrichment. The Office of the Dean of Students is available during the orientation period and throughout the year to answer questions and provide assistance. The Freshman Affairs unit of that office has special responsibility for monitoring the academic progress of all freshmen and for assisting them in a variety of ways to attain sophomore status.



Part Four

General Information



General Information

History

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. By special enactment, the state legislature has given the University general degree-granting powers. The University is governed by a Board of Trustees who are elected by and from the Northeastern University Corporation, which is composed of 174 distinguished business and professional men and women.

From its beginning, Northeastern University's dominant purpose has been the discovery of community educational needs and distinctive and serviceable ways of meeting them. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Arts and Sciences (1935), Education (1953), Pharmacy (1962), Nursing (1964), Boston-Bouv   College (1964), the College of Criminal Justice (1967), Lincoln College's daytime Bachelor of Engineering Technology Program (1971), and by University College in a special pilot program (1980). This educational method offers students the opportunity to gain valuable practical experience as an integral part of their college programs and also provides the means by which they may contribute substantially to the financing of their education. The plan has been extended to the graduate level in criminal justice, engineering, rehabilitation administration, professional accounting, business administration, and law.

In the field of adult education, the University offers graduate and undergraduate degree programs and noncredit programs that are specifically designed to meet the needs and interests of adults who wish to further their education on a part-time basis.

All formal courses of study leading to degrees in the Graduate Division, Lincoln College, and University College are approved by the undergraduate faculties concerned and are governed by the same qualitative and quantitative standards as the regular day curricula. Courses are scheduled in the day and evening at the Boston Campus, Suburban Campus in Burlington, and at other off-campus locations near Boston.

Policy on Changes of Program

The University reserves the right to withdraw, modify, augment, or change the order or content of courses in any curriculum.

It further reserves the right to change the requirements for graduation, tuition, and fees charged, and other regulations.

Any changes which may be made from time to time pursuant to the above policy shall be applicable to all students in the school, college, or department concerned, including former students who may re-enroll.

Textbooks and Supplies

The Northeastern University Bookstore, located on the ground floor of the Ell Student Center, is a department of the University and is operated for the convenience of the student body. All books and supplies that are required by the students for their work in the University may be purchased at the Bookstore.

The Academic Year

Northeastern University operates on a quarter-system calendar.

Quarter-Hour Credits

All courses are evaluated in terms of quarter-hour credit. A quarter-hour credit is equal to three-fourths of a semester-hour credit.

Grades and Examinations

Examinations covering the work of the quarter usually are held at the close of each quarter. Exceptions may be made in certain courses where, in the opinion of the instructor and with the approval of the dean of the college concerned, final examinations are not necessary.

Pass-Fail System

Students may register for a limited number of courses on a pass-fail basis. Each college has its own rules governing this system. Common to all colleges, however, is the grading system. Pass-fail grades are not included in the calculation of the quality point average. Only pass grades earn credits toward degree requirements. (Pass-fail guidelines are also stated in the *Student Handbook*.)

Grades

A student's grade is officially recorded by letter. Introduced in September 1980, the following grades, listed below with their numerical equivalents, are in effect:

A	4.000
A –	3.667
B +	3.333
B	3.000
B –	2.667
C +	2.333
C	2.000
C –	1.667
D +	1.333
D	1.000
D –	.667
F	0

A general average of C – is not acceptable and will not allow a student to continue at Northeastern University.

Freshman students who are taking a full academic program and who have a weighted average for the year below 1.4 will not be permitted to register for advanced work. Upperclass students should consult the *Student Handbook* to ascertain the level of continuing achievement required of them by the faculty of their college.

An I, or X (Incomplete), grade is used to show that the student has not completed the course requirements.

An official University grade report is mailed to each student at the end of each quarter.

Transcripts

Applications for transcripts of record are made at the Registrar's Office (120 HA). A charge of \$2.00 is made for each transcript request.

Dean's List

An Honors or Dean's List is issued at the end of each quarter. The list contains the names of students who have a 3.0 weighted average or higher, with no I grade or grade below C. Students who are on any form of probation, enrolled in courses on a Pass-Fail basis (except where there is

no alternative or where required by the program), or who are not carrying full loads as determined by their basic college will not be eligible.

Dean's List with Honor	3.000–3.490
Dean's List with High Honor	3.500–3.740
Dean's List with Highest Honor	3.750–4.000

Reports on Scholastic Standing

Reports for all students are issued at the end of each grading period. Questions about grades are to be discussed with the student's faculty adviser.

At the end of the academic year, juniors will receive, in addition to their term reports, a complete cumulative copy of their permanent records so that they may be aware of any discrepancies in their records and, if so, should contact the dean of their college.

Students are constantly encouraged to maintain an acceptable quality of college work. Parents and students are always welcomed by the college officers and faculty advisers for conference upon such matters.

Family Educational Rights and Privacy Act

In accordance with the Family Educational Rights and Privacy Act of 1974, Northeastern University permits its students to inspect their records wherever appropriate and to challenge specific parts of them when they feel it necessary to do so. Specific details of the law as it applies to Northeastern are printed in the *Student Handbook*, which is distributed annually at registrations.

It is the policy of Northeastern University to deal with the student in all academic and administrative matters. If parents require any information regarding the progress of their son or daughter, they may contact the Dean of Students' Office.

General Conduct

It is assumed that students come to the University for a serious purpose and that they will conform to such regulations as may from time to time be made. The University community expects each student to respect the rights and privileges of others and to adhere to acceptable standards of personal conduct. Students should exercise their freedom with maturity and responsibility. They are expected to obey University regulations and follow the instructions of and pay due respect to University officials. Conduct inconsistent with the general order of the University may result in disciplinary action. Damage to any building or to any of the furniture, apparatus, or other property of the University will be charged to the student or students known to be immediately involved.

The University seeks to administer discipline with a high standard of integrity and a scrupulous regard for truth. Any student's attempt to present any work not his or her own or to pass any examination by improper means is regarded as a most serious offense and renders the offender liable to disciplinary action. Aiding and abetting a student in any dishonesty is also held to be a grave breach of discipline.

Attendance

Students are expected to attend all meetings of their classes. Absence from regularly scheduled classes may seriously affect the standing of the student and result in the University's dropping the subject or subjects from his or her schedule. Laboratory work can be made up only during hours of regularly scheduled instruction.

Emergency Closing of the University

Students, faculty, and staff are notified by radio when it becomes necessary to cancel classes because of extremely inclement weather. Radio stations WRBB, WRKO, WBZ, WEEI, WHDH, WCOZ-FM, WLYN-FM, WKOX, WVBF-FM, WBCN-FM, WHUE, WHAV, WLLH, and WJDA will announce the University's decision to close.

ROTC

Military Officers Education Program

Army

Richard A. James, LTC, U.S.A.; M.A., *Professor and Chairman*

General Objectives

The Department of Military Science administers Northeastern's ROTC Program. Regarded by the University as an integral part of its education program, ROTC is available on a voluntary basis to all full-time students. The program's mission is to develop officers—leaders. It offers courses of instruction designed to lead to a commission as an Army second lieutenant.

The ROTC staff consists of active Army officers and NCOs, assigned by the Department of the Army.

Courses of Study

The program consists of the Basic Course (freshman and sophomore years) and the Advanced Course (middler, junior, and senior years) and complements the co-op program by tailoring the courses to the student's schedule.

Enrollment in the Basic Course is voluntary and is open to all students of the Basic Colleges who qualify. Students do not incur a military obligation if they withdraw from the Basic Course.

The Advanced Course is open to all qualified students who meet these prerequisites: (1) completion of Basic Course or approved equivalent, or prior honorable military service; (2) physical aptitude and medical requirements; and (3) age requirements. Students accepted for the Advanced Course execute a written contract that obligates the newly commissioned second lieutenant to a period of military service. Advanced Course students receive a \$100/month stipend (\$2,000 total). They are also paid for the six-week advanced camp normally attended during their junior and senior year.

ROTC Scholarships

The Army ROTC scholarship provides full tuition, fees, textbooks, and \$100 per month to the recipient. Scholarships are available in varying lengths and cover the cadet's remaining academic years. *Non-cadets* may apply for scholarships covering their last four or three academic

years. These awards are not related to financial need, and a student's earnings during cooperative work periods do not reduce scholarship payments.

Veterans and Transfer Students

Honorably discharged veterans (enlisted) are a vital part of our cadet corps and will receive special consideration for ROTC entry.

Transfer students, whether or not previously enrolled in ROTC, are also welcome to join our program. They should contact the Department of Military Science concerning their options for program entry.

Uniforms and Equipment

Uniforms are issued without cost to ROTC cadets. A \$25 deposit is required to ensure the return of the loaned property in good condition. Loss or damage to Army equipment, exceeding the deposit, will be charged to the student.

Academic Credits

Regulations of the individual Basic Colleges prevail for ROTC graduation credit. However, students may petition individually their academic department for acceptance of certain courses for graduation credit.

Air Force

Albert T. Hamilton, M.S., LTC, USAF

Professor and Chairman, Department of Aerospace Studies, B.U.

The Air Force Reserve Officers' Training Corps (AFROTC) program at Northeastern University offers students an opportunity to earn a commission in the United States Air Force while completing graduate or undergraduate degree requirements. The Aerospace Studies curriculum is designed to help develop leadership skills while concurrently offering students the chance to become familiar with Air Force functions, organization, equipment, and management and with its role in national defense. The student is commissioned upon successful completion of both the Aerospace Studies curriculum and Northeastern University requirements for an undergraduate or graduate degree. Northeastern University students may enter the AFROTC program as members of either a four- or two-year program. Participation in AFROTC during the first two years of the four-year program carries no commitment to serve in the Air Force.

The entire AFROTC program at Northeastern is administered by AFROTC Detachment 355, 156 Bay State Road, at Boston University (telephone: 353-4705). All AFROTC classes are conducted at the B.U. campus. For further information contact the B.U. office.

Division of Cooperative Education

Cooperative education is a dynamic system of education based on the principle that students develop most effectively through an educational program that provides for periodic exposure to the world that exists beyond the campus. Through controlled and structured experiences, students bring an enrichment to the classroom that enhances their total development. The essential factors are that satisfactory participation in cooperative education is considered a degree requirement and that the educational institution assumes the responsibility for integrating these experiences into the education process. It is called "cooperative education" because it is dependent upon the cooperation of outside agencies, educators, and students to produce an integrated program.

Studies have shown that the reinforcement of classroom learning by job responsibilities increases a student's motivation and self-confidence. Greater interest in academic work develops when the student sees the relation between job responsibilities and principles studied on campus. These experiences can also help to instill a sense of identity and worth as the student functions as an adult in an adult world.

Northeastern's commitment to cooperative education is illustrated by the diverse but related activities of the five departments within the Division of Cooperative Education. Each department makes a unique contribution to the development of cooperative education and the enhancement of its effect on Northeastern's students.

The Department of Cooperative Education

Paul M. Pratt, M.Ed., *Dean*

Richard E. Sprague, M.B.A., M.Ed., C.A.G.S., *Assistant Dean*

Professors

Nancy J. Caruso, M.Ed.

Charles F. Field, M.Ed.

George K. Howe, M.Ed.

Robert W. Miller, M.Ed.

Homer C. Littlefield, B.S.

Judith A. Moll, M.S.

Anthony R. Rotondi, M.Ed.

Willie Smith, Jr., M.Ed.

Roderic W. Sommers, M.Ed.

Hugh J. Talbot, M.P.A.

Associate Professors

Boreslaw P. Berestecky, M.Ed.

Betsey W. Blackmer, M.Ed.

Richard L. Canale, M.Ed.,

C.A.G.S.

Elizabeth A. Chilvers, M.Ed.

Mark I. Conley, Jr., Ed.D.

Robert D. Deforge, M.Ed.

Rosemarie DiMarco, M.S.

Philip W. Dunphy, M.Ed.

Mary R. Flynn, M.Ed.

Kenneth R. Hancock, Jr., B.S.

Stephen M. Kane, Ed.D.

Gerard J. Lavoie, M.P.A.

Assistant Professors

Michael A. Ablove, M.Ed.

Robert S. Brown, M.B.A.

Donald L. Eastridge, M.Div.

Kathleen L. Finn, M.S.

John C. Mulhall, M.S.

Melvin W. Simms, Ed.D.

William A. Sloane, M.B.A.

Robert T. Tillman, M.Ed.

Patrick F. Todd, B.S.

Instructors

Jean F. Egan, M.Ed.

Veronica M. Leona, M.Ed.

Peter J. Mollo, M.Ed.

The largest department in the Division, the Department of Cooperative Education is responsible for the administration of the cooperative education program for undergraduate and graduate students at Northeastern. Details on the specifics of operation are explained on page 30 of this catalog and in a booklet entitled *Co-opportunities*, which is available on request from the Department of Admissions.

Life/Career Planning Program

Joseph E. Barbeau, M.Ed., Ed.D., *Acting Director*

The fundamental mission of the Life/Career Planning Program is to offer students a variety of career-related services. Those who may be undecided about their academic major or career direction or who want to explore career options and formulate postgraduation plans may elect any of several courses which are open to all undergraduate majors. In some cases, students are required by their major departments to take a Life/Career Planning course during their freshman year. Students needing assistance in designing or revising their personal résumé may attend a regularly scheduled résumé workshop or may use the drop-in service of the Career Resource Center. Also available in the Center is an open-shelf collection of print materials and a computer terminal for obtaining information on jobs and careers, local and regional industries, and graduate and professional schools.

International Cooperative Education

Robert E. Vozzella, M.A., C.A.G.S., *Director*

Northeastern University carries its unique program in cooperative education to the international scene by offering undergraduate and graduate students the opportunity to be placed abroad for their cooperative work and by operating Exchange Co-op programs with a number of foreign institutions. Placements are available in the United Kingdom, Germany, Sweden, Ireland, France, and Israel for students whose linguistic, academic, and professional experience makes them competent candidates for positions abroad.

The Center for Cooperative Education

Paul E. Dubé, M.A., M.Ed., *Director*

Educational institutions and other organizations exploring, developing, expanding, or improving programs in cooperative education contact the Center for a variety of services. All facets of the establishment, operation, and expansion of programs may be explored with professional consultants familiar with all aspects of cooperative education. In addition to providing technical assistance, the Center will conduct evaluations of cooperative education programs for both educational institutions and employers.

Intensive, short-term training workshops for both new and experienced coordinators of cooperative programs and the four-week Summer Institute in Cooperative Education offering eight quarter hours of graduate credit are among the other services offered by the Center.

The International Secretariat was organized to continue the efforts begun at The Second World Conference on Cooperative Education, sponsored by Northeastern University in April 1981. The Secretariat assists

business, industry, education, and government in the design and implementation of programs to effectively relate education, training, and work in countries outside of the United States.

The Center for Secondary School Work Experience Education

Ellen N. Winer, Ed.D., *Director*

A full complement of consulting, training, and research services is available to schools and other educational facilities, community groups, and employers interested in implementing or expanding work experience programs at the secondary school level. These services are designed to assist school faculty who have primary responsibility for initiating and conducting work experience programs in planning, implementing, and evaluating their efforts.

The Cooperative Education Research Center

James W. Wilson, Ph.D., *Asa Smallidge Knowles Professor of Cooperative Education and Director*

Various aspects of the effectiveness of cooperative education are continuously investigated by the staff of the Research Center, and the results are published and disseminated among the cooperative education community. The purpose of these studies is to aid practitioners in the field so that they can be of greater service to students enrolled in cooperative education programs. As a part of its research activity, the Research Center has established an information clearinghouse to store information about cooperative education and make it available to interested people throughout the country. A library of cooperative education and related material is maintained for research and consulting purposes.

Department of Career Development and Placement

Sidney F. Austin, M.Ed., *Director*

The Department of Career Development and Placement offers a wide range of counseling and placement assistance to all seniors and alumni of Northeastern University seeking employment; to undergraduates seeking admission to graduate schools, including medicine and law; and to students interested in participating in non-paid, part-time internships in private or public nonprofit agencies for which they may receive academic credit.

Through this department, representatives of hundreds of employers are scheduled to visit the campus each year to interview seniors and graduate students for full-time employment after graduation. A job bank of currently available positions is maintained for alumni who are seeking new opportunities for which they may be qualified. Credential service is provided for students and alumni seeking positions in the field of education. Regularly scheduled seminars are conducted for seniors and alumni on career development, job-finding techniques, résumé preparation, and effective interviewing. Individual career counseling is available for seniors and alumni of all University programs.

University Libraries

Roland H. Moody, A.B., B.L.S., *Director*

"All that mankind has done, thought, gained, or been: it is lying as in magic preservation in the pages of books."—Thomas Carlyle

The University libraries endeavor to provide the informational and bibliographic services required by students and scholars working in subject fields covered by University programs of instruction and research. In all, the collections include more than 500,000 cataloged volumes. In addition, the library holds in excess of 500,000 titles on microform, including the comprehensive *Libraries of American Civilization and English Literature*.

The microform collection includes microprint, microfilm, and microfiche with appropriate equipment for reading.

Periodicals (approximately 3,900 titles received currently), government documents relevant to the University, technical reports, pamphlets, and recordings (more than 5,000) enhance the collections. There are duplicating facilities available in all libraries.

Libraries

The Dodge Library houses the main collections, the main bibliographic resources for the library system, the central processing units, and library administration. Its seven air-conditioned reading rooms, many recently renovated, include the Richardson Room; the Reference Room, with a collection in excess of 20,000 volumes including almanacs, atlases, bibliographies, biographical dictionaries, information on business services, dictionaries, directories, encyclopedias, gazetteers, handbooks and manuals, indexes and abstracts, and technical reports; the Periodical Room; the Documents Room; the Microform Room; the Reserve Book Room, with a 20,000-volume collection; and the Fine Arts Room.

Additional libraries include the divisional libraries of Physics/Electrical Engineering, Mathematics/Psychology, and the Hurtig Hall Library (Chemistry, Biology, and Pharmacy)—all graduate-level collections; the Boston-Bouvé College of Human Development Professions Library; and the School of Law Library. The Suburban Campus at Burlington has its own library, and there are also collections at the Marine Science Institute in Nahant and at the Center for Management Development in Andover.

Services and Hours

A handbook, A-V aids, bibliographic guides, and lectures introduce students to methods of utilizing the resources of the collections, and a dedicated staff is prepared to help users of the various libraries. All members of the University, and others at the discretion of the Librarian, have the use of reference books, government documents, card catalogs, and service. During term time, most libraries are open 7:45 a.m. to 10:00 p.m., Monday through Thursday; 7:45 a.m. to 7:30 p.m. on Friday; 12:00 p.m. to 4:00 p.m., Saturday and Sunday, with certain areas in the Dodge Library open later hours in the evening.

New England Library Information Network

The Northeastern libraries have computerized many operations internally and, in addition, hold membership in the New England Library Information Network. NELINET has been established for the purpose of developing and operating major library support services. It is a network of librar-

ies devoted to sharing financial, human, and material resources to reduce cost and redundancy and to expand the timeliness and variety of services available.

Office of Learning Resources

Mina B. Ghattas, Ph.D., *Director*

The primary mission of the Office of Learning Resources is to help support the instructional and communications needs of the University. The philosophy of the Office of Learning Resources is keyed to that of the University: to provide faculty and students with a comprehensive range of modern and efficient tools for teaching and learning, to support scholarship and inquiry, to communicate effectively, and to be professionally active.

Instructional Development and Evaluation Services Instructional Development and Evaluation Services assists individual faculty with specifying instructional goals, reviewing related literature and materials, examining alternative teaching strategies, producing learning materials, and evaluating course effectiveness. Its training in presentation and teaching techniques is complementary to its basic function of developing instructional units and courses.

Media Production Services Media Production Services coordinates and provides professional consultation and specialized services in graphics, photography, audio recording, television, and multimedia production for various University needs. In a media production laboratory, facilities and assistance are provided for students, faculty, and staff to produce their own materials, such as charts, graphs, illustrations, layouts, overhead transparencies, and photographic slides. Training workshops in media production and utilization may be arranged for organized groups.

Learning Resources Center The Learning Resources Center furnishes students with tutoring services and individualized study facilities in support of regular course requirements as well as supplemental instruction in many subject areas. Study materials here are presented in varied interactive formats, including programmed texts, audiotapes, videotapes, sound filmstrips or slides, computer-assisted lessons and exercises, and related workbooks. One of the major LRC facilities is its language laboratory. A listening lounge, equipped with a stereophonic sound system, supplies a large selection of classical and popular pre-recorded music. A number of terminals that allow users to access the University's central computer are located in the LRC.

A new adjunct facility, the Center for Assessment, Tutoring, and Enrichment Resources (CATER), to supplement certain mathematics courses through a combination of computer-assisted instruction, video technology, and tutoring, is also part of the LRC complex. Students may use LRC facilities independently or to complete class assignments at no cost during day, evening, and weekend hours.

Instructional Materials Services Instructional Materials Services, which acquires and maintains the collection of NU-owned instructional materials, also provides a rental service for 16-mm films and videotapes obtained from outside sources. Faculty who would like to evaluate in-

structional materials before purchase make use of its preview service. Preview facilities for all types of materials are available for small-group viewing by members of the University community. An up-to-date collection of research reports, periodicals, instructional materials, catalogs, and other reference volumes on all aspects of instructional media and technology is similarly accessible.

Campus Media Services Campus Media Services makes available all types of audiovisual and video equipment and instructional materials for the support of classroom instruction on a prescheduled basis. Items include film, filmstrip, slide, opaque and overhead projectors, audio and videotape recorders, TV cameras and monitors, portable public address systems, telelecture equipment, record players, and projection screens. This section also distributes instructional materials from the NU-owned collection, such as 16-mm films, videotapes, filmstrips, film loops, slides, and audio cassettes. Certain equipment is reserved for student use, and students may also borrow instructional materials with faculty approval. A catalog of all instructional materials is available at no charge.

University Health Services

Lane Health Center

Job E. Fuchs, M.D., *Director*

A comprehensive program of medical care is provided to all full-time registered students in the Basic Colleges, both graduate and undergraduate. The University maintains a Health Services Clinic in the Forsyth Building, Room 135, which is open for emergencies at all times and is equipped to deal promptly with any medical condition that may arise. All entering students must file a record of physical examination with Health Services. Failure to fulfill this requirement can delay registration and result in a penalty fee and an additional fee for a physical examination. Regular clinic hours for the student body are held by staff physicians from 9:00 a.m. to 4:30 p.m., Monday through Friday. Health Services can be reached at all times by telephoning 437-2772.

Specialty clinics in surgery, orthopedic surgery, gynecology, and fertility control and planning are scheduled at specified hours. Please check times with the Health Services office. Pregnancy testing and venereal disease diagnosis and treatment services are always available during clinic hours. Allergy testing and treatment for students with allergic problems are done at the Lane Health Center at no cost except for a nominal fee for the cost of the extracts. Allergic desensitization injections using extract provided by the student's own physician will be given at no cost provided the extract is received in good condition, properly labeled, and with a dosage schedule. Consultation with the various medical and surgical specialists who are not physically present in the clinic will be arranged when deemed necessary by a Health Services physician. The cost of the first visit will be borne by the Health Services.

Special X-ray and laboratory procedures that are unavailable in the Health Services but are deemed necessary by a staff physician will be provided. A full spectrum of mental health services is available. A mental health specialist is present daily, and students are urged to use this service even for minor emotional upsets.

All full-time graduate and undergraduate students are covered by a special Blue Cross and Blue Shield policy, which remains in effect continuously from the day of initial registration until the first of the month following withdrawal, dismissal, or graduation. Married students are urged to go to the Finance Office (249 Richards Hall) to purchase supplementary coverage for dependents.

An infirmary is also maintained in the Forsyth Building for the care of students living in University dormitories and apartment houses. The required infirmary fee entitles students to twenty days' care in the infirmary at no additional charge.

Students are urged to come to the clinic *during regular clinic* hours in order to take advantage of all of our facilities.

The Reading Clinic

A facility of the Curriculum and Instruction Department, Boston-Bouvé College of Human Development Professions

Melvin Howards, Ph.D., *Director*

In full operation since the spring of 1970, the Northeastern University Reading Clinic serves approximately 400 persons each year, making it one of the largest reading clinics in the country. The clinic offers a wide range of diagnostic and corrective services for all types of reading and language problems to persons of all ages, including Northeastern students.

Space The clinic occupies a suite of 14 private rooms at 1 Holmes Hall, Boston. As the need arises, other instructional spaces are made available. Videotape recording space for taping and viewing exists. Audio-tape recorders and various other media equipment are available at the Campus Media Services to assist the clinic staff in improving the quality of instruction.

Resources The Northeastern University faculty have skills needed for a wide range of testing: WAIS, WISC, Binet, ITPA, Bender, and all standardized tests.

Procedure If you need or want help in learning how to read or write, no matter what your age or educational experience, call the clinic at 617-437-3305 or 3306 and make an appointment for initial testing. After the test, you may be assigned to a place in the clinic when there are openings.

Speed Reading The Reading Clinic offers a special noncredit course in speed reading designed to improve skills in rapid, study, critical, and pleasure reading. Whether the desire is to increase speed, to improve understanding, or both students have the opportunity to learn to apply tested reading and study techniques that improve accuracy and recall in all normal reading assignments.

The course is offered during the fall, winter, spring and summer quarters. Students may register during the first week of each quarter. Classes meet one evening a week from 4:00–6:30 or 7:00–9:30.

A discount tuition rate is available for Northeastern University staff, students, and alumni, and all materials are usually supplied at no expense.

The Counseling and Testing Center

Philip W. Pendleton, Ph.D., *Director*

The purpose of the Counseling and Testing Center is to offer assistance to students in a wide variety of areas such as career planning, personal and life adjustment problems, study skills, anxiety, choice of major, and interpersonal relationships. At the Center, students are encouraged to discuss their concerns with a counselor, following which they may decide to continue individual counseling, take psychological tests to increase their knowledge of themselves, join a group of students with whom they can share concerns, or make use of the Center's extensive file of information about careers and services.

The Center's services are available, without charge, to all students in the Basic Colleges. Students can arrange an appointment by telephoning 617-437-2142 or by visiting the Center in Room 302 Ell. Vocational counseling services are also available on a fee basis to high school students and adults.

The counseling services of the Counseling and Testing Center are approved by the International Association of Counseling Services.

Preprofessional Advising

The Pre-Health Professions Advisory Committee, a University-wide group, offers preprofessional counseling for students interested in a career in medicine, dentistry, or related professional medical fields. The Committee members are available to discuss the various medical fields, minimum admissions requirements, and application process.

For students preparing for a career in law, there are also a number of faculty members who can serve as advisers and resource personnel on related curricular and admissions questions.

In addition, the Department of Graduate Placement Services provides information and advice on procedures for admission, preparation of applications, and the scheduling of appropriate admissions tests.

For further information regarding the above, student should contact Ms. Gail Leclerc in 400 Meserve Hall.



International Student Information

The University welcomes qualified students from foreign lands who are adequately prepared to benefit from the educational, cultural, and social opportunities it has to offer. Currently, over 2,100 international students from ninety-five different countries attend Northeastern.

Northeastern University is authorized under federal law to enroll non-immigrant aliens as full-time students in degree-granting programs of its basic undergraduate colleges and graduate schools. Part-time and special students are not included in this authorization.

Because of problems of adjustment experienced by many students from foreign countries, the University makes a special effort to evaluate carefully the educational and financial qualifications of prospective students. The University has an international student adviser and staff to administer to the special needs of these students.

University admissions policies for international students are found on page 214.

The University does not award financial aid to international students at the undergraduate level.

The International Student Office

Sally M. Heym, B.A., *Director*

The International Student Office has been established to assist international students in all matters relating to their legal status as foreign nationals in the United States. Through a variety of publications, counseling services, and social and cultural activities, the International Student Office seeks to bring about a meaningful stay for international students at Northeastern and to provide opportunities for Americans to meet them. Specific activities include quarterly orientation programs, cultural evenings, ski trips, and an International Day. The ISO also publishes a quarterly newsletter.

International students who have never attended an institution of higher learning or who have already attended college or a university and want to transfer to Northeastern should write to the Department of Admissions for information and applications. Applicants who have already received a degree or diploma from a university or college and seek information concerning graduate schools at Northeastern should write to the specific graduate school in which they are interested in matriculating.

English Language Center

Paul C. Krueger, C.A.G.S., *Director*

The English Language Center provides an important resource for international students at Northeastern. Its goal is to ensure that students who speak English as a second language are proficient enough to carry on full-time studies in a degree program without language-related problems. The Center administers the Intensive English Program, which offers three levels of intensive, noncredit courses in English as a second language—beginning, intermediate, and advanced. Intensive English classes are open to undergraduate and graduate students, as well as to students who come to Northeastern to study English only. Those students also admitted to a degree program in the University may take, with the approval of the Director of the English Language Center and the chairman of the department concerned, one or two courses for credit while studying Intensive English at the advanced level.

The Intensive English Program offers a minimum of twenty-two hours of instruction per week, as well as a number of special services. The weekly program includes classes in English structure and in reading and study skills, small group tutorials, practice in a language laboratory and in a writing laboratory, and help from a pronunciation specialist as needed. English Language Center staff work closely with staff from the International Student Office, as well as from other offices in Student Affairs, the academic departments, and other University services.

In addition to serving students, the English Language Center provides advice and consultation to the Northeastern community at large. Center staff are available to answer questions from teachers, administrators, and students and are able to design special programs for special needs at short notice.

For more information about the English Language Center call 617-437-2455.

Academic Computer Services

Robert J. Fitzpatrick, B.S., *Acting Director*

During the last two decades the computer has dramatically evolved from a research-oriented, problem-solving tool to the familiar device employed throughout our automotive, banking, merchandising, manufacturing, energy, communications, health care, education, and entertainment industries. At Northeastern, the ongoing expansion of computer facilities reflects the University's recognition of the essential role played today by this new technology, as well as its even greater potential over the next decade.

Academic Computer Services, located in the basement of Richards Hall (telephone: 437-2335), supports the research, teaching, and learning activities of faculty, research personnel, and graduate and undergraduate students. The computational capability of this facility is supplied by three Digital Equipment Corporation VAX-11/780 systems. Each VAX-11/780 is a state-of-the-art 32-bit virtual memory machine optimized for interactive computing. In addition, there are ten Digital Equipment Corporation LSI-11 microcomputers, each configured with dual floppy disks and video terminal. Finally, for more advanced applications, there exists a multiterminal Computervision Computer-Aided-Design/Computer-Aided-Manufacturing (CAD/CAM) system.

Both students and faculty access these systems in a time-sharing environment through video and hard-copy terminals arranged in student and faculty clusters, as well as from dial-in telephone lines. Color-graphics devices and word-processing packages are also available. The primary languages supported are FORTRAN, COBOL, BASIC, PASCAL, and VAX Macro Assembler. Numerous software libraries are available for numerical, statistical, and financial applications. Both faculty and students can readily obtain programming assistance in order to promote effective utilization of all facilities.

Office of Services for the Handicapped

Ruth K. Bork, M.Ed., *Director*

Very often, the degree of physical accessibility and types of available support services play an important part in a disabled student's selection of a college. An examination of Northeastern University's campus map shows the buildings to be located within relatively close proximity to one another. Nearly all buildings have elevators that are open to use by all. A special advantage at Northeastern is the existence of a tunnel system, constructed prior to 1965, that links all buildings; in the harsh New England winters and during inclement weather, this proves to be a welcome feature to all.



Any student who has a disability-related special need—no matter how small or individual—can receive ready support services from the Office of Services for the Handicapped (OSH). Frequently, students are uncertain about how they may be aided by this office, and in these situations a discussion of possible alternatives can be quite helpful. OSH provides a wide range of support services to eliminate the competitive disadvantages that a disability may create. Services are individually tailored to meet the needs of each student.

If you have a disability, you are strongly urged to meet with the staff in OSH early on in your consideration of Northeastern. Together, you can discuss the types of service that would best meet your needs, and you will have an opportunity to see the campus firsthand. If a visit is not possible, contact the OSH Director by phone or by mail to avoid the unnecessary delays and confusion that may arise with last-minute adjustments; telephone: 617-437-2675 (voice) or 617-437-2730 (TTY).

The following types of assistance are available from the Office of Services for the Handicapped:

Orientation—Tailored to the needs of specific disability groups, orientation utilizes tactile maps for vision-impaired students, interpreters for hearing-impaired students, and accessible routes of travel for mobility-impaired students.

Registration and Preregistration—Assistance to help ensure class accessibility and course adaptation.

Counseling—Personal, academic, and referral services.

Housing—Necessary modification in residence halls.

For the Visually Impaired Students—OSH assists in securing taped and braille textbooks and materials; readers; campus orientation; tactile maps; and auxiliary aids such as brailor, Visualtek reader, raised-line drawing kits, large-print typewriter, talking-book machine, magnifiers, talking calculators, and variable-speed tape recorders.

For the Hearing-Impaired Student—OSH offers services including oral and sign language interpreters; notetakers; TTY; audiometric testing, hearing-aid evaluation, fitting, and orientation; instruction in sign language and speech reading; speech therapy. Sign-language interpreting and oral interpreting services will be provided to deaf and hearing-impaired students only after they have been denied such services by their Division of Vocational Rehabilitation, provided the Office of Services for the Handicapped has received information documenting the reason for such denial.

For the Wheelchair User/Mobility-Impaired Student—OSH offers information on appropriate routes of travel, assistance in relocating classes, adaptive physical education, and physical therapy.

General Assistance Services—Includes scribes; advocacy liaison with instructors and other University staff; HP parking; corrective tutoring in English writing, reading, and language problems; special examination situations.

Information Clearinghouse—Offers articles, periodicals, books, and other literature for, about, and by disabled individuals.

The Office of Services for the Handicapped is also the gathering place for the Disabled Student Organization of Northeastern University, which works cooperatively with OSH to plan programs and improve accessibility of services for handicapped persons at Northeastern.

Visitor Information Center

Christopher Mackey, B.A., *Director*

The Visitor Information Center, located in 115 Richards Hall, provides information to visitors to the University campus in the form of maps, guides, pamphlets, brochures, catalogs, newspapers, magazines, and other promotional publications. Staff members are available to personally answer questions, give directions, and provide friendly and accurate advice about the university and its programs for students and faculty as well as for visitors. The Visitor Information Center also operates a twenty-four-hour Northeastern University events line, a prerecorded telephone message (1-800-322-1277), listing daily and weekly events open to the public, including arts, sports, lectures, general interest happenings, and special offerings held at or sponsored by the University. To arrange to have an event listed on the NU Events Line or to have a publication distributed to visitors to the Visitor Information Center, call the information specialists at 437-2736.

Office of Parents' Services

Virginia A. Stephanos, M.S.Ed., *Director*

The Office of Parents' Services provides a central counseling and resources operation for parents of undergraduate and graduate students at Northeastern, facilitating the resolution of problems and exchange of information. The Office maintains contact with the various academic deans' offices, with Cooperative Education, Dean of Students, Financial Aid, Housing, Registrar's Office, Bursar, and other administrative departments that may relate to parents' concerns. In addition, the Office also offers parents social and cultural programs to promote a better understanding of Northeastern's diversified academic and administrative departments.

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Academic Calendar 1982–1983

September 1982

6	Monday	LABOR DAY. University closed.
7–10	Tuesday– Friday	Final Examinations for Basic Colleges.
13–21	Monday– Tuesday	Division B vacation.
16	Thursday	FALL COMMENCEMENT.
17	Friday	Transfer Orientation
20	Monday	Freshman Orientation Boston Class 1987
22	Wednesday	Burlington Orientation
22	Wednesday	Beginning of 1982–1983 academic year. Upperclass registration for Divisions B and C and new freshman course registration.
23	Thursday	Classes begin in Basic Colleges for Fall Quarter.

October 1982

11	Monday	COLUMBUS DAY. University closed.
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November 1982

11	Thursday	VETERANS' DAY. University closed.
25–27	Thursday– Saturday	THANKSGIVING DAY recess.

December 1982

13–17	Monday– Friday	Final Examinations for Basic Colleges.
20–Jan. 2	Monday– Sunday	CHRISTMAS vacation.

January 1983

1	Saturday	NEW YEAR'S DAY. University closed.
3	Monday	BASIC COLLEGES ONLY. Orientation of all <i>newly</i> admitted students in Basic Colleges. 9 a.m. upperclass registration Divisions A and C. 1 p.m. registration for Quarter 2, Class 1987. Start of UC, LC, Graduate Winter Quarter.
15	Saturday	MARTIN LUTHER KING, JR.'S BIRTHDAY. University closed.

February 1983

21	Monday	WASHINGTON'S BIRTHDAY. University closed.
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March 1983

21–25	Monday– Friday	Final Examinations for Basic Colleges.
28–April 2	Monday– Saturday	Vacation period for all students in all colleges and schools (Division A vacation).

April 1983

4	Monday	Registration for Divisions B and C and Division A seniors. Registration for freshmen (Quarter Three) at Boston Campus, Burlington Campus, and January freshmen (Quarter Two). Beginning of Spring Quarter. Beginning of Division A work period.
18	Monday	No Basic Colleges classes today. PATRIOTS' DAY. University closed.

May 1983

30	Monday	MEMORIAL DAY. University closed.
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June 1983

13-17	Monday- Friday	Final Examinations for Basic Colleges.
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19	Sunday	COMMENCEMENT.
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20-25	Monday-Saturday	Division B vacation.
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27	Monday	Registration for Divisions A and D and January freshmen (Quarter Three). Beginning of Summer Quarter. Beginning of Division B work period. No Basic Colleges classes today.
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July 1983

4	Monday	INDEPENDENCE DAY. University closed.
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September 1983

5	Monday	LABOR DAY. University closed.
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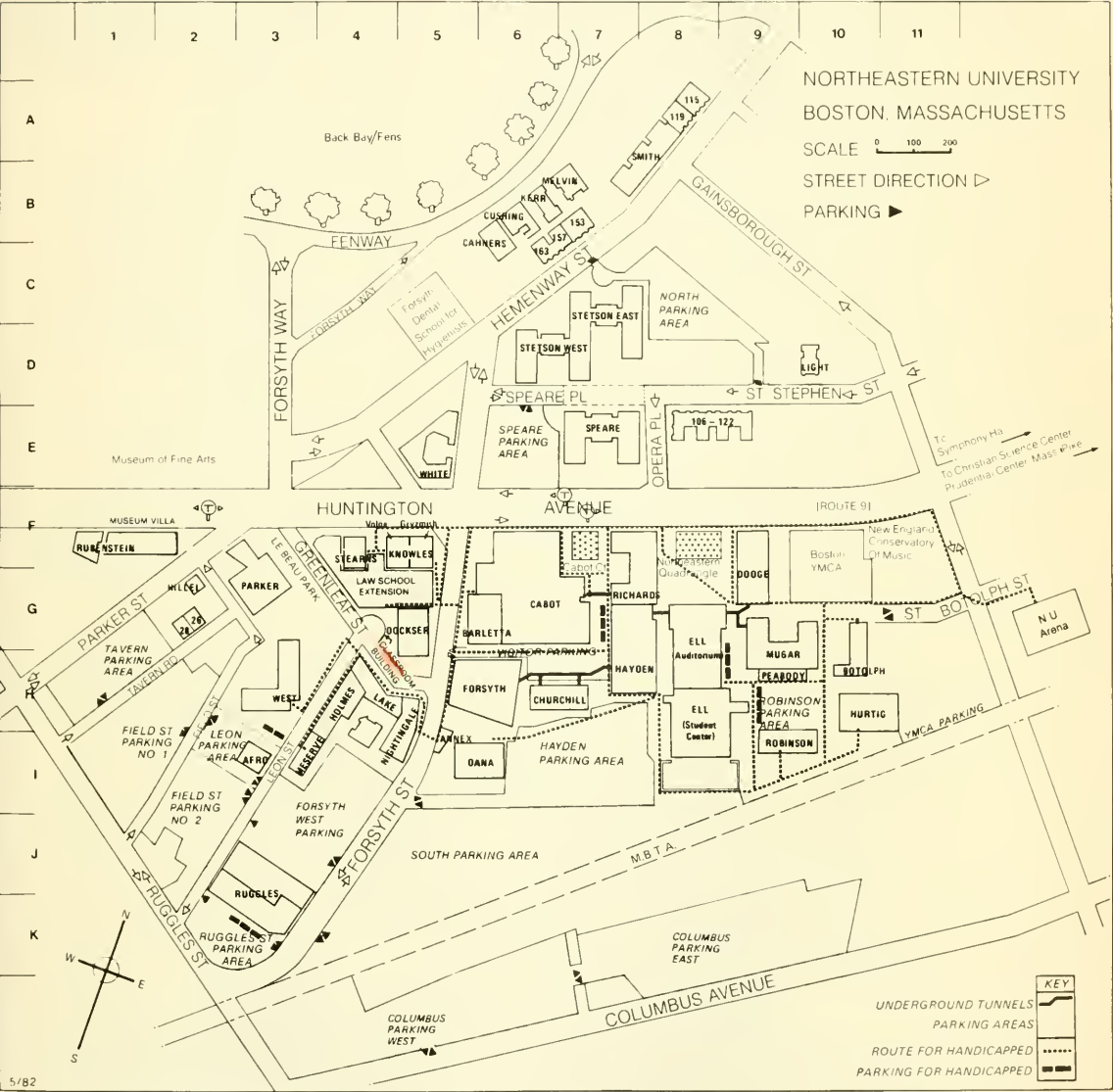
6-9	Tuesday-Friday	Final Examinations for Basic Colleges.
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15	Thursday	FALL COMMENCEMENT.
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12-24	Monday-Saturday	Division A vacation.
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26	Monday	Beginning of 1983-1984 academic year. Upperclass registration for Divisions A and C. Boston and Burlington freshmen complete their registration. No Basic Colleges classes today.
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Calendar dates are subject to change. The University community will be notified if such changes are necessary.



Maps are provided by the Visitor Information Center, 115 Richards Hall, extension 2736.

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